United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

In Reply Refer To:
FWS-SB-16B0304-17F0351

January 31, 2017

Lieutenant Colonel T.B. Pochop
Marine Corps Air Ground Combat Center
Marine Air Ground Task Force Training Command
Building 1451, Box 788110
Twentynine Palms, California 92278

Subject: Biological Opinion for Land Acquisition and Airspace Establishment, Twentynine Palms, California (8-8-11-F-65R)

Dear Lieutenant Colonel Pochop:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposal for expansion of military training activities at the Marine Corps Air Ground Combat Center (MCAGCC), and its effects on the federally threatened Mojave desert tortoise (*Gopherus agassizii*). This document was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.) (Act). The proposed action involves modification of existing training on MCAGCC and expansion of training activities into 679.8 square kilometers of public and private land to the west and southeast of the existing installation. This biological opinion replaces our July 17, 2012 biological opinion previously issued for the proposed action (8-8-11-F-65; Service 2012f). Your May 12, 2016 request for re-initiation of formal consultation was received in our office on May 13, 2016 (DoN 2016).

The implementation of the proposed action described in this biological opinion requires some actions or authorizations from the Bureau of Land Management. We have designated the Marine Corps as the consultation lead because they have the principal responsibility for the project. This biological opinion analyzes the Marine Corps and Bureau of Land Management actions together. We have indicated those pieces of the proposed action that include Bureau of Land Management's authorization. While the Bureau's land use approval is covered by this biological opinion, there is no take specifically identified with the Bureau's approval that is separate or in addition to those actions to be implemented by the Marine Corps. The Bureau's use authorization of its administered lands does not result in additional take above the take associated with the Marine Corps actions. All on the ground actions and potential for take and required reporting fall under the Marine Corps actions and responsibility.

This biological opinion is based on information you provided in the final desert tortoise translocation plan, correspondences addressing boundary changes and other modifications created through passage of the National Defense Authorization Act of 2014 (NDAA), your February 18, 2011 request for formal consultation, and additional scientific information provided

by your staff (MCAGCC 2016b, DoN 2014a, DoN 2011e). A complete administrative record of this consultation is on file at the Carlsbad Fish and Wildlife Office.

CONSULTATION HISTORY

On February 18, 2011, the Marine Corps requested formal consultation on its land expansion and airspace establishment proposal (DoN 2011e). On April 1, 2011, we denied the Marine Corps' initial request for consultation due to insufficient information and provided comments (Service 2011a) on the initial biological assessment (DoN 2011d). On June 30, 2011, we met with the Marine Corps to discuss our comments.

On July 11, 2011, the Marine Corps requested formal consultation (DoN 2011f) a second time and provided a final biological assessment (DoN 2011a). In August 2011, we met with the Marine Corps via teleconference to discuss the new biological assessment and the remaining pieces of information required for consultation (e.g., translocation plan). On September 16, 2011, we denied the Marine Corps' second request for formal consultation and identified the remaining items needed for consultation, which primarily focused on translocation of desert tortoises (Service 2011b). Following revisions to the biological assessment and further discussion of additional information needed to complete consultation, the Service acknowledged the initiation of formal section 7 consultation on October 18, 2011; we considered consultation to have been initiated on September 21, 2011.

On November 9, 2011, we met with the Marine Corps to discuss information related to the consultation and the development of a consultation agreement that would identify time lines for completion of our biological opinion. At this meeting, the Marine Corps agreed to finalize a translocation plan and we agreed to provide recommendations to offset the unavoidable effects of the proposed expansion. On November 28, 2011, we met with the Marine Corps to discuss the framework for the translocation plan and to provide guidance on development of this document. On December 8, 2011, we received the Marine Corps' final translocation plan (MCAGCC 2011). On December 9, 2011, the Marine Corps and the Service signed a consultation agreement that identified specific time frames for completion of the consultation (Service and DoN 2011).

On January 17, 2012, we provided the Marine Corps with a recommended strategy for offsetting the unavoidable effects of the proposed action (Service 2012a). On February 2, 2012, the Marine Corps responded to these recommendations (DoN 2012a) and identified portions of our recommendation that it would commit to implement. On February 10, 2012, we provided the Marine Corps with a draft project description for the biological opinion and requested comments. On February 14 and March 2, 2012, the Marine Corps provided comments on the draft project description for the biological opinion (Henen 2012a, 2012b), which we have incorporated herein. On February 29, 2012, the Marine Corps provided further clarification of the conservation actions it was proposing to offset the adverse effects of the proposed action (DoN 2012b). On March 12, 2012, we proposed changes to the Marine Corps' action that would reduce adverse effects to the desert tortoise. On March 22, 2012, the Marine Corps provided a follow-up letter, pursuant to its February 29, 2012 letter, that proposed additional

conservation actions and provided details to its previous letter (DoN 2012c). On April 5, 2012 we met with the Marine Corps to discuss the effects of the proposed action and recommended changes to the proposed action and conservation actions that would reduce and offset its effects. The Marine Corps provided further clarification and commitments regarding changes to its conservation strategy on April 12, 2012, to respond to the recommendations made at the April 5 meeting (Rowley 2012a).

On May 3, 2012, we provided the Marine Corps with a revised description of its conservation proposal that clarified what we would include in the biological opinion (Noda 2012). On May 10, 2012, the Marine Corps provided a finalized description of conservation measures to minimize and offset effects to the desert tortoise (Henen 2012c). On May 17, 2012, the Marine Corps provided a memorandum for the record, indicating that it would move the location of the staging area in the southern expansion area to the north into areas that contained a lower density of desert tortoises (Cottrell 2012). On May 21, 2012, the Marine Corps provided a description and map of the location of off-highway vehicle (OHV) exclusion barriers it would install to reduce effects to the Ord- Rodman ACEC (Henen 2012d).

On June 25, 2012 we provided a draft biological opinion to the Marine Corps (Service 2012d). The Marine Corps provided comments on the draft biological opinion via electronic mail, dated July 2, 2012 (Rowley 2012b). On July 17, 2012, we transmitted our Biological Opinion for Land Acquisition and Airspace Establishment to Support Large-scale Marine Air Ground Task Force Live-fire and Maneuver Training (Service 2012f). This biological opinion concluded that the proposed action was not likely to jeopardize the continued existence of the desert tortoise, and was not likely to destroy or adversely modify critical habitat of the desert tortoise.

On July 29, 2014, the Marine Corps provided information on: 1) the change in boundary between the Exclusive Military Use Area (EMUA) and the Shared Use Area (SUA; referred to as the "restricted public access area, [RPAA]" in the previous biological opinion) in the western expansion area resulting from the NDAA; 2) a shift of a western special use area (and potential desert tortoise recipient site) from its proposed location to the southern portion of the Bullion Range Training Area (RTA); and 3) changes to conservation measures contained in the Service's 2012 biological opinion (Service 2012f), specifically the use of existing routes by Conservation Law Enforcement Officer (CLEO) patrols and convoys to discourage trespassing in the EMUA. The Marine Corps requested our concurrence that a re-initiation of formal consultation on the 2012 biological opinion (Service 2012f) was not warranted due to reduced overall effects to the desert tortoise (DoN 2014a). On December 2, 2014, we transmitted our concurrence to the Marine Corps that re-initiation of formal consultation due to changes to the proposed action resulting from the NDAA was not warranted (Service 2014).

On December 5, 2015, the Marine Corps provided a new translocation plan identifying new translocation sites and more complete information on the number of desert tortoises that the Marine Corps would translocate and some baseline data on desert tortoise populations that were resident to the translocation areas (MCAGCC 2015). On December 17, 2015, we provided the Marine Corps with comments (Service 2015a) on the December 5, 2015 draft translocation plan.

On February 10, 2016, we met with the Marine Corps to discuss the comments we provided on the December 5, 2015 draft translocation plan. On March 3, 2016, the Marine Corps provided a revised draft translocation plan (MCAGCC 2016a).

On May 12, 2016, we received the Marine Corps' request for re-initiation of formal consultation on the Service's 2012 biological opinion (DoN 2016a). On May 26, 2016, we provided the Marine Corps with comments (Service 2016a) on the March 3, 2016 draft translocation plan. On June 3, 2016, we met with the Marine Corps to discuss the comments we provided on the March 3, 2016 draft translocation plan. On June 26, 2016, the Marine Corps provided a final translocation plan (MCAGCC 2016b). On July 15, 2016, we acknowledged the re-initiation of formal section 7 consultation on the July 17, 2012 biological opinion.

On August 16, 2016, we provided the Marine Corps with a draft project description for the biological opinion and requested comments. On November 9, 2016, we received the Marine Corps' comments on the draft project description for the biological opinion. On November 10, 2016, we provided the Marine Corps with a draft Status of the Species section and a draft Environmental Baseline section for the biological opinion. On November 18, 2016, we provided the Marine Corps with draft portions of the Effects of the Action section that addressed military training and translocation.

On November 21, 2016, we met with the Marine Corps to discuss preliminary findings and potential conservation actions for the biological opinion. On December 12, 2016, we met with the Marine Corps to discuss final conservation action commitments for the biological opinion.

On December 20, 2016, we requested confirmation from the Marine Corps that it was not requesting formal consultation on the effects of the action, as modified since the 2012 biological opinion, on critical habitat. On December 21, 2016, the Marine Corps transmitted its concurrence that it was not requesting formal consultation on the effects of the current action on critical habitat.

The 2012 biological opinion analyzed the effects to critical habitat associated with displacement of OHV recreation into critical habitat from the proposed closure of portions of the Johnson Valley OHV Management Area. It also analyzed the effect of installing repatriation pens for translocation within critical habitat. In 2014, the National Defense Authorization Act of 2014 transferred portions of the OHV area to the Marine Corps resulting in closure to public use and displacement of OHV recreation to other areas. As discussed in the 2012 biological opinion, we anticipate that some of this displacement is affecting critical habitat for the desert tortoise. We do not anticipate additional OHV displacement through the current proposed action. In addition, the Marine Corps is no longer proposing to install repatriation pens within critical habitat. Finally, we have concluded that implementation of the conservation actions described in the proposed action below (e.g. barriers, law enforcement patrols, route closures, etc.) will have negligible effects on the physical and biological features of critical habitat. Consequently, we have not addressed the effects of the current proposed action, as modified since the 2012 biological opinion, on critical habitat for the desert tortoise.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Summary of Changes from the 2012 Proposed Action

The Marine Corps has proposed training activities within the expanded boundaries of MCAGCC. Expansion of the existing MCAGCC boundaries occurred through the withdrawal or purchase of 679.8 square kilometers of public and private lands. The 2014 National Defense Authorization Act (NDAA) completed the transfer of public lands to MCAGCC. These lands are to the west and south of the existing installation and include portions of the Bureau of Land Management's (Bureau) Johnson Valley OHV Management Area (western expansion area; 593.6 square kilometers) and an area north of Wonder Valley (southern expansion area; 86.2 square kilometers) (DoN 2011a; Figure 1-2). The western expansion area includes an Exclusive Military Use Area (EMUA) and a Shared Use Area (SUA[1]); the southern expansion area is an EMUA. In the western expansion area, the Marine Corps would allow continued public use of the SUA for recreational purposes (e.g., OHV use, rock hounding, rocketry, film production, camping, etc.) when it is not in use for military training activities.

The 2014 NDAA changed the boundary between the EMUA and the SUA in the western expansion area that we analyzed in the 2012 biological opinion (Service 2012f). This reduced the size of the EMUA and expanded the size of the SUA by 60.3 square kilometers, respectively (DoN 2014a; Figure 1). They now encompass 378.9 square kilometers in the EMUA and 214.6 square kilometers in the SUA. The new boundary also divided a 21.0 square-kilometer special use area that the Marine Corps included in the 2012 consultation. To address this, the Marine Corps removed this special use area and replaced it with a 22.3 square kilometer special use area in the southern portion of the Bullion Range Training Area (RTA) (DoN 2014a). Special use areas, which will be managed to protect against potential effects from training activities and unauthorized access, will be designated as part of the Marine Corps' proposed conservation actions. The Marine Corps also proposed to change the use of Conservation Law Enforcement Officer (CLEO) patrols and convoys in the EMUA in the western expansion area to reduce trespass from OHVs that began occurring following passage of the NDAA (DoN 2014a). The Marine Corps has also proposed changes to the translocation recipient sites and other aspects of the desert tortoise translocation plan based on data collected during pre-translocation investigations.

[1] Referred to as the "restricted public access area," or "RPAA" in the 2012 biological opinion

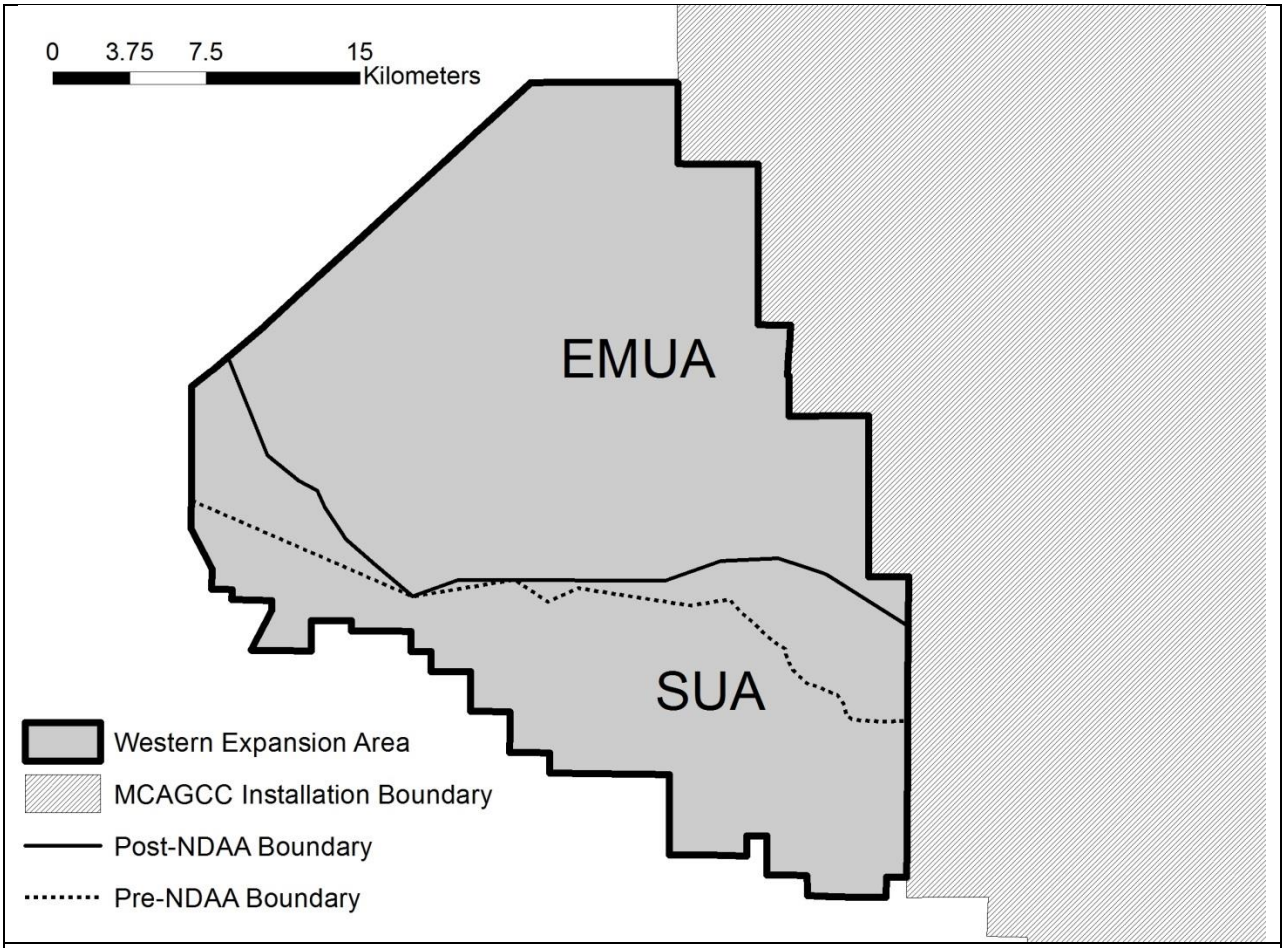


Figure 1: Boundaries of the Exclusive Military use Area (EMUA) and Shared Use Area (SUA) before and after the 2014 National Defense Authorization Act (NDAA)

With respect to the military training activities and training range maintenance in the land acquisition and airspace establishment proposal for MCAGCC, the Marine Corps has not changed the description of the project from the previous consultation. We have restated these aspects of the proposed action from the 2012 biological opinion and all of the previous minimization measures (Service 2012f). Since the previous consultation, the Marine Corps has implemented these mitigation measures as needed, has implemented CLEO patrols and convoys in the EMUA in the western expansion area to reduce OHV trespass, and has completed 3 years of pre-translocation data collection as required by the desert tortoise general translocation plan analyzed in the 2012 biological opinion (MCAGCC 2011; Service 2012f). The Marine Corps has not implemented any other aspects of the project description from the 2012 biological opinion, including conservation actions to address the effects of OHV displacement from the Johnson Valley OHV Management Area.

The revision to the project description in this biological opinion focuses on the changes to the boundaries of the EMUA and SUA within the western expansion area resulting from the NDAA,

changes to conservation measures implemented by the Marine Corps (i.e., use of CLEO patrols and convoys in the EMUA of the western expansion area), and changes to the translocation plan. The following description of the proposed action is based on information contained in the biological assessment (DoN 2011a), the 2012 biological opinion (Service 2012f), information provided by the Marine Corps regarding changes to the project description due to the NDAA (DoN 2014a), communications regarding the Marine Corps' conservation action commitments, and the final translocation plan (MCAGCC 2016b).

Description of Military Training Activities

Marine Expeditionary Brigade Exercises

Expanded training activities would involve air-ground, live-fire maneuvers within the existing installation and the expanded training areas, and are collectively termed Marine Expeditionary Brigade (MEB) exercises. Each MEB exercise would involve an entire MEB, consisting of three battalion task forces totaling approximately 15,000 Marines, 1,786 wheeled and tracked vehicles, and 1,657 aircraft sorties. Two MEB exercises, lasting 24 days each, would occur each year with six days of cleanup activities following each MEB exercise. The biological assessment provides a representative depiction of the type of maneuvers that MEB work-up exercises would involve (see Figure 2 and DoN 2011a).

Following these work-up scenarios, each MEB exercise would involve a final exercise in which the entire MEB (i.e., three battalion task forces) would maneuver from three separate staging areas to converge on a single MEB objective over the course of a 48- to 72-hour period. This would occur within three separate maneuver corridors, beginning in the eastern portion of the existing installation and ending in the western expansion area. The biological assessment provides a representative depiction of the final MEB exercise, including staging areas, maneuver routes, firing zones, intermediate company objectives, and the MEB objective (DoN 2011a; Figure 2-3).

Military training would result in severe ground disturbance in all portions of the MEB objective, company objectives, starting point staging areas, and re-supply points due to use of live ordinance, large-scale maneuvers using tanks and other vehicles, excavations for fighting positions and target placements, and clearing of vegetation for staging areas and other purposes. The MEB objective, company objectives, and starting point staging areas would not change following establishment, but re-supply points may change between exercises, these points would remain close to the maneuver corridors. The biological assessment provides a representative depiction of the varying intensities of ground disturbance associated with training maneuvers (see Figure 3 and DoN 2011a). As noted in the Consultation History, the Marine Corps has agreed to modify the location of the staging area in the southern expansion area previously analyzed in the 2012 biological opinion to avoid areas of higher desert tortoise density.

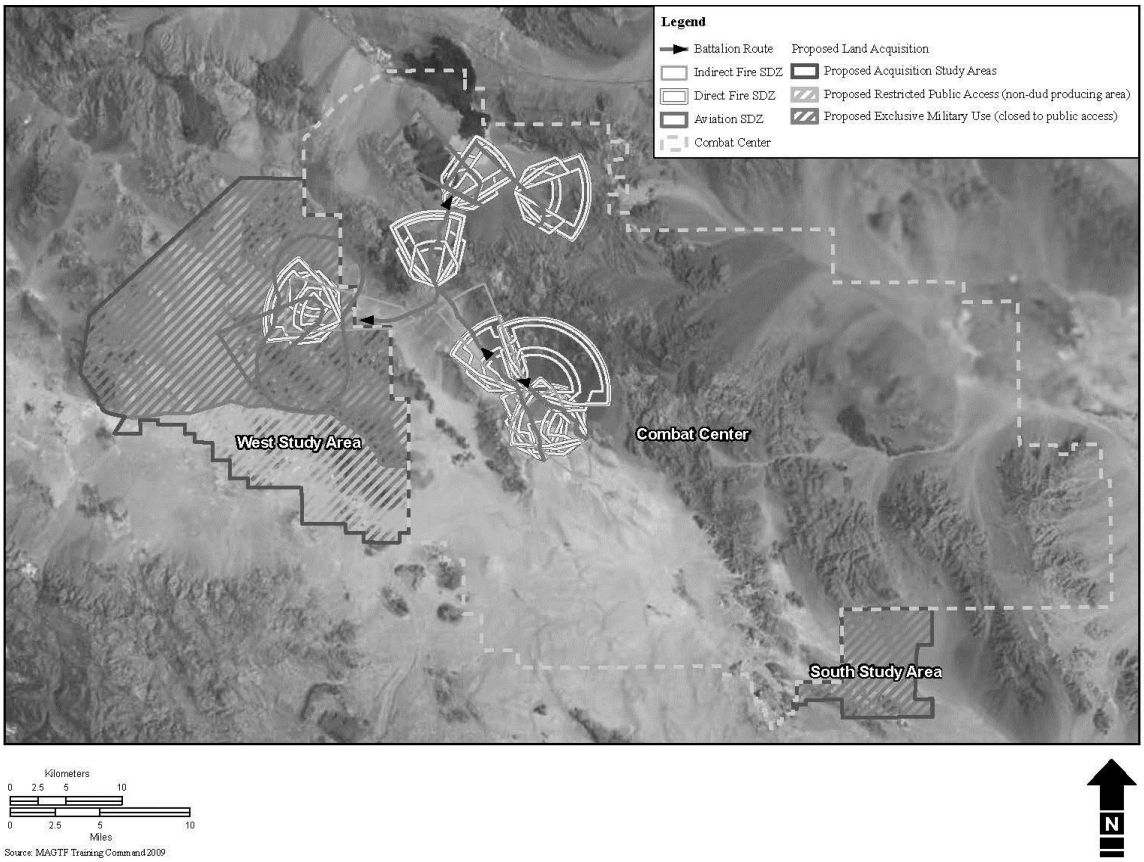


Figure 2: Representative MEB exercise work-up scenario[2]

[2] Figure 2 was developed by the Marine Corps as part of the 2011 biological assessment (DoN 2011a); the West Study Area is equivalent to the Western Expansion Area, and the South Study Area is equivalent to the Southern Expansion Area in this biological opinion.

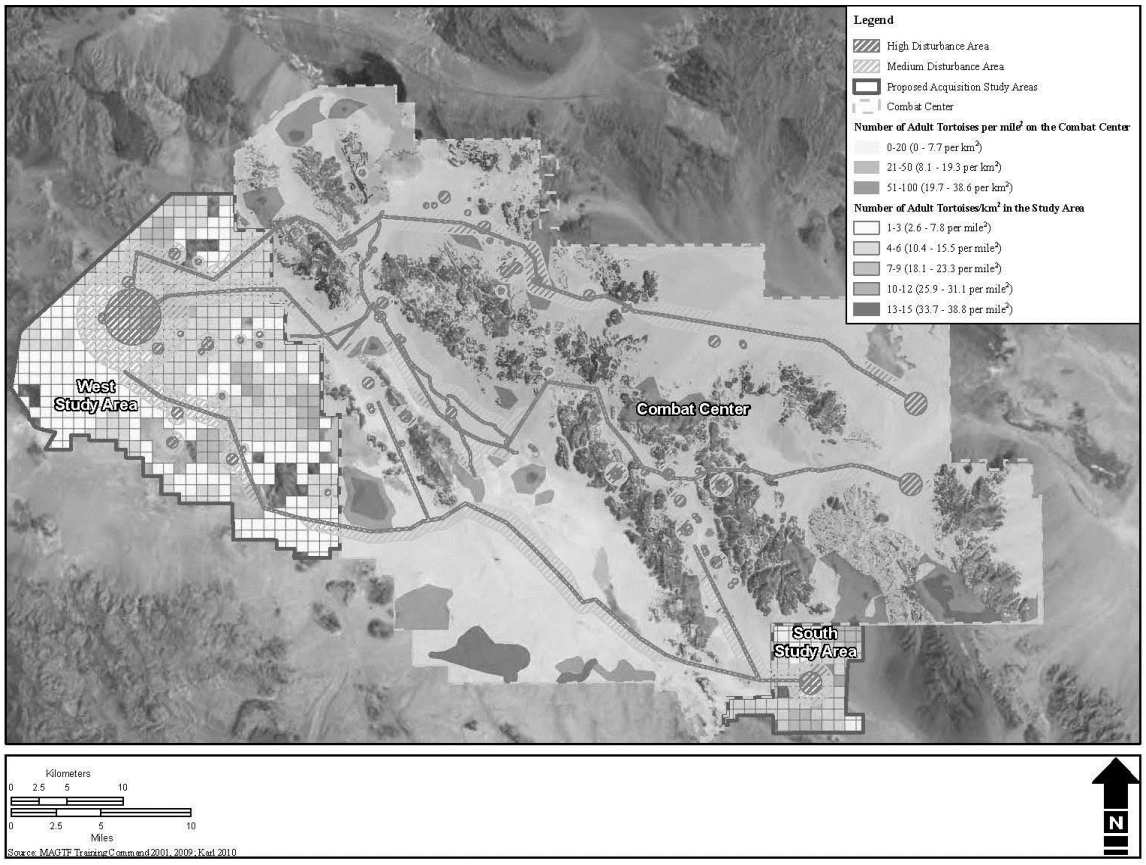


Figure 3: Predicted levels of ground disturbance to desert tortoise habitat[3]

Although military training would focus on the maneuver corridors and disturbance areas depicted in the biological assessment, cross-country maneuvers could occur in virtually any portion of the expanded installation (i.e., the pre-expansion installation plus the western and southern expansion areas) except for special use areas (see below). Cross-country travel would be concentrated in the vicinity of the staging areas, MEB and company objectives, and along the periphery of the main supply routes, and would diminish in other portions of the installation and expansion areas that are farther away from these locations. In general, maneuvers would occur in areas of level to gently sloping terrain, with steeper and rockier areas and areas farther from the main maneuver corridors subject to less surface disturbance. The Effects of the Action section of this biological opinion provides the Marine Corps' estimates for high- and moderate-intensity habitat disturbance associated with expanded military training.

[3] Figure 3 was developed by the Marine Corps as part of the 2011 biological assessment (DoN 2011a); the West Study Area is equivalent to the Western Expansion Area, and the South Study Area is equivalent to the Southern Expansion Area in this biological opinion.

Building Block Exercises

When MEB exercises are not occurring, the Marine Corps would use the western expansion area's exclusive military use area to perform building block exercises that are consistent with the type of military training that currently occurs on the existing installation. These building block exercises may replace similar training activities that currently occur on the MCAGCC. Building block exercises would consist of four-day training exercises repeated throughout the year for a total of approximately 160 days each year. Building block exercises would involve the same activities described above for the MEB exercises, but they would involve smaller units (i.e., 2,000 Marines), fewer vehicles (i.e., approximately 276 wheeled and tracked vehicles and 56 aircraft sorties), and a smaller and more localized footprint. The biological assessment provides a representative depiction of a typical building block exercise (see Figure 4 and DoN 2011a).

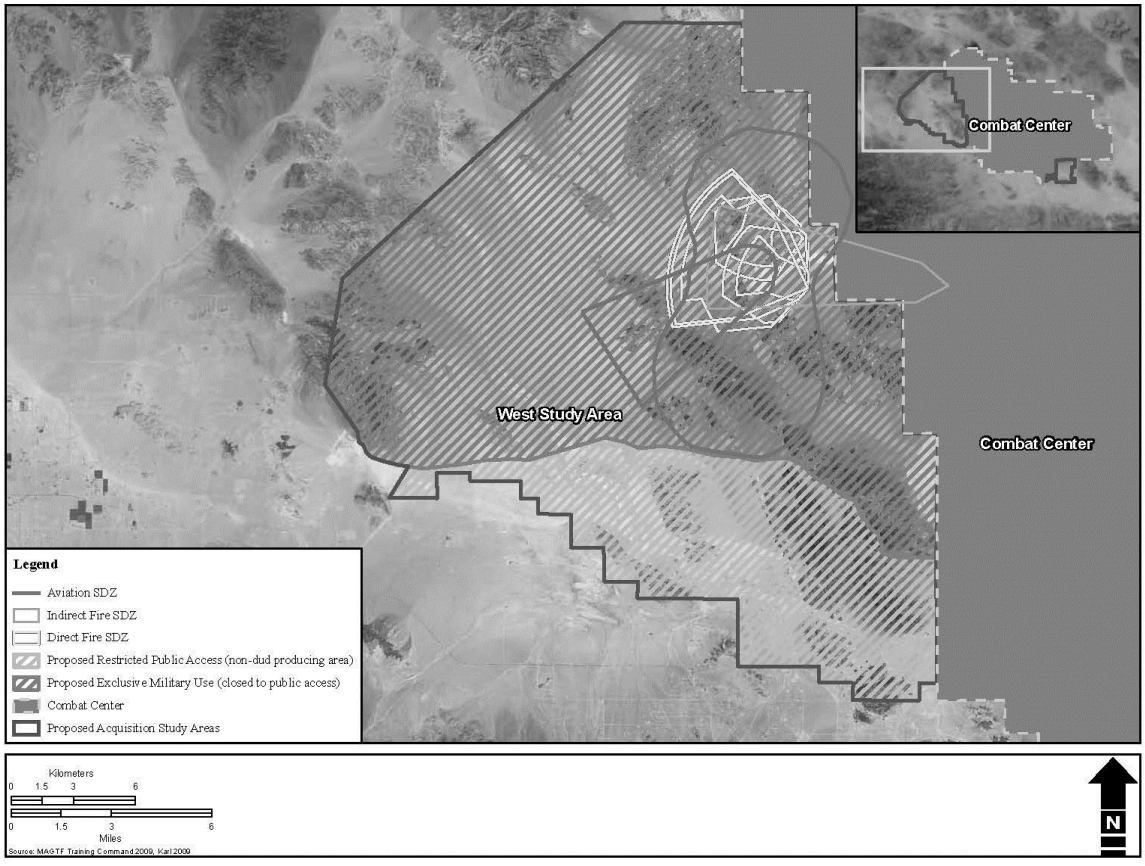


Figure 4: Representative building block exercise[4]

[4] Figure 4 was developed by the Marine Corps as part of the 2011 biological assessment (DoN 2011a); the West Study Area is equivalent to the Western Expansion Area in this biological opinion.

Training Range Maintenance

Following exercises, participating units would perform a sweep of the training ranges to remove discarded training equipment, trash, and other materials (DoN 2011a). Maintenance personnel would then use existing routes of travel to reset targets, grade and repair existing travel routes, and dispose of unexploded ordinance. Unexploded ordinance disposal would likely require detonation of identified materials in place. Maintenance activities would require two vehicles and occasionally a tractor trailer, at a maximum of ten days per MEB exercise, for a total of 20 days per year. Limited amounts of similar range maintenance would occur in association with building block exercises. Range maintenance activities, especially unexploded ordinance sweeps, would be more intensive in the SUA.

Shared Use Area (SUA)

The SUA encompasses a 214.6 square-kilometer area in the southern portion of the western expansion area where limited public access would be allowed when the area is not being used by the Marine Corps for the MEB training exercises (see Figure 1). The Bureau would control public access through a permit system, and estimates the SUA would be open to public use approximately 10 months out of the year. Although the Marine Corps is the consultation lead for the proposed action, management of the SUA will require coordinated management with the Bureau.

Proposed Measures to Avoid, Reduce, and Offset the Adverse Effects of the Proposed Action

The Marine Corps will implement measures to avoid and reduce the effects of the proposed action on the desert tortoise and will perform conservation actions within the Western Mojave Recovery Unit to offset some adverse effects of military training.

General Minimization Measures

To minimize adverse effects to the desert tortoise, the Marine Corps will implement the following protective measures during use of the expanded MCAGCC installation. We developed these measures with the Marine Corps based on the measures in the biological opinion for base-wide operations and existing Service guidance (Service 2002, 2009a, 2016c). Through coordination with the Marine Corps, we have modified the wording of some measures from that provided in the biological assessment. We have done this to improve clarity and to incorporate more current Service guidance, but we have not substantially changed the intent of the measures identified in the biological assessment (DoN 2011a).

1. The Marine Corps will appoint an official representative to oversee compliance with all protective measures for the desert tortoise. This person will receive and investigate reports of non-compliance and will have the authority to stop all activities that may violate these measures.

2. The Marine Corps will continue to implement a desert tortoise education program for military and civilian personnel that train or work on MCAGCC. All personnel will receive this program prior to proceeding with training exercises, construction projects, or other activities that may affect desert tortoises. This program will also be required of SUA users through the permitting system that the Bureau will manage. The program will include the following: a) information on the biology and distribution of the species, b) its sensitivity to human activities, c) legal protection for the species and penalties for violation of Federal laws intended to protect it, d) its general activity patterns, e) the required measures for minimizing effects during training and construction-related activities, f) reporting requirements and measures to take if a desert tortoise is encountered, and g) measures that personnel can take to promote the conservation of desert tortoises.

3. The Marine Corps will inform all personnel of their responsibility to report any form of injury or mortality of desert tortoises to the official responsible for overseeing compliance with the protective measures.

4. The Marine Corps will place signs promoting awareness of desert tortoises in key locations to encourage personnel not to stray off established main and secondary routes.

5. The Marine Corps will require all personnel on MCAGCC to remove or contain foodstuffs, trash, or other wastes that may attract predators. The Marine Corps will require the use of latching or locking lids on all trash receptacles used for extended stays.

6. The Marine Corps will concentrate training activities that cause increased surface disturbance to pre-designated hardened sites, or within 200 meters of main supply routes, once these sites and routes are established. The Marine Corps will limit off-road activity to that which is necessary to support the mission directly and will plan maneuvers to emphasize use of already disturbed sites.

7. During training maneuvers, the Marine Corps will limit “neutral steer” turns of tracked vehicles (i.e., running tracks in the opposite directions from each other, so that the vehicle pivots in place) to emergency situations. The Marine Corps will identify authorized areas for practicing “neutral steer” turns that are away from special use areas and other biologically sensitive areas.

8. The Marine Corps will require that temporary fighting positions and other types of temporary excavations are filled to original grade and excess material leveled after each training exercise.

9. Contractor and maintenance personnel will remain on main or secondary main supply routes whenever possible. Personnel will only travel off the supply routes when no other route exists to the objective.

10. The Marine Corps will post and enforce a 32.2 kilometer-per-hour (20-mile-per-hour) speed limit for contractor, construction, and maintenance personnel on all roads within desert tortoise habitat.

11. The Marine Corps will require personnel to obtain approval of the G-3 Directorate and the Natural Resources and Environmental Affairs (NREA) Division prior to clearing land (grading) or conducting any other vegetation removal action in the training areas.

12. The Marine Corps will ensure that all personnel immediately report to a MCAGCC-authorized desert tortoise biologist (i.e., a biologist authorized by the Service) any desert tortoises if they are within or immediately adjacent to training exercises or construction projects that may kill or injure them.

13. The Marine Corps will ensure that only authorized biologists handle desert tortoises or their eggs except in circumstances where the desert tortoise is in immediate danger of injury and mortality or is impeding an active training exercise. Use of authorized biologists and biological monitors will be in accordance with the most recent Service guidance (Service 2008a). The Marine Corps will ensure that biologists do not perform specialized handling activities (e.g., transmitter placement, health assessments, or blood collection) for which they are not specifically authorized by the Service.

14. If a desert tortoise is in immediate danger, the Marine Corps will ensure that it is moved into adjacent undisturbed habitat and placed in a shaded area, out of direct sunlight. If a desert tortoise is not in danger but is impeding military training, Marine units will notify Range Control and request instructions. Only appropriately briefed Marines, with direct radio or telephone communication with Range Control and authorization from NREA authorized biologists, will move desert tortoises. In these instances, the Marine Corps will move desert tortoises only the minimum distance to ensure their safety.

15. The Marine Corps will ensure that personnel inspect beneath and around all parked vehicles, located in desert tortoise habitat, prior to moving the vehicle. If a desert tortoise is located beneath a vehicle and is not in immediate danger or impeding training, the Marines will allow the tortoise to move on its own or they will contact Range Control for instructions. Only appropriately briefed Marines, with direct radio or telephone communication with and authorization from Range Control, will move desert tortoises. In these instances, the Marine Corps will move desert tortoises only the minimum distance to ensure their safety.

16. When requesting authorization of biologists to handle desert tortoises, the Marine Corps will submit the credentials to the Service for review and approval at least 30 days prior to the need for the biologist to perform those activities in the field. For authorization of specialized handling activities (e.g., transmitter placement or health assessments), the Marine Corps will clearly define activities for which it is requesting authorization and provide credentials that are specific to those activities.

17. All handling of desert tortoises and their eggs will comply with the protocols outlined in the Desert Tortoise Field Manual (Service 2009a) unless specifically modified by this biological opinion. When performing tasks where tools and equipment may contact desert tortoises, the Marine Corps will ensure that biologists disinfect all tools via the Service's disease prevention protocols (Service 2016c) or most recent Service guidance.

18. The Marine Corps will ensure that desert tortoises are handled only when air temperature, measured at two inches above the ground (shaded bulb) is not expected to exceed 35 degrees Celsius (95 degrees Fahrenheit) during the handling session. If air temperature exceeds 35 degrees Celsius during handling or processing, desert tortoises will be shaded in an environment where the ambient air temperatures do not exceed 32.8 degrees Celsius (91 degrees Fahrenheit). The Marine Corps will not release desert tortoises until the air temperature at the release site has declined to below 35 degrees Celsius and is expected to remain below 35 degrees Celsius for the remainder of that day.

19. The Marine Corps will ensure that authorized biologists follow the protocols outlined in Service (2016c) or the most current Service guidance when performing health assessments on the desert tortoise.

20. The Marine Corps will ensure that authorized biologists re-hydrate desert tortoises that void their bladder using epicoelomic injections of sterile saline or by nasal or oral administration of drinking water. If a desert tortoise smaller than four inches in carapace length voids its bladder, the Marine Corps will offer fluids nasally or orally.

21. The Marine Corps will not translocate or otherwise move wild desert tortoises that show clinical signs of disease. If the Marine Corps locates a desert tortoise that must be moved, and it has clinical signs of upper respiratory tract disease, they will quarantine this individual and contact the Service to determine appropriate disposition of the animal.

22. The Marine Corps will ensure that authorized biologists mark desert tortoises in accordance with the Desert Tortoise Field Manual (Service 2009a) or other Service-authorized method.

23. The Marine Corps will ensure that authorized biologists attach only transmitters of appropriate size to desert tortoises. Transmitter mass will not exceed 10 percent of the desert tortoise's mass.

24. The Marine Corps will ensure that authorized biologists attach transmitters to the fifth vertebral scute of large[5] male and small desert tortoises. For female desert tortoises, the

[5] For the purposes of this biological opinion, we will generally reference size class as "large" (i.e., equal to or larger than 160 millimeters) and "small" (i.e., smaller than 160 millimeters) desert tortoises. In certain contexts we will also use "adult" (i.e., equal to or larger than 180 millimeters) and "juvenile" (i.e., smaller than 180 millimeters) when the terminology is relevant to the data presented.

Marine Corps will attach transmitters to the anterior carapace in the most appropriate place to preclude interference with righting. The Marine Corps will attach an antenna sheath just above the marginal scutes of each desert tortoise's shell. The antenna sheath will be slightly larger diameter than the antenna and will be split at each scute seam to prevent interference with natural shell growth.

25. The Marine Corps will ensure that authorized biologists replace transmitters earlier than the recommended battery life of the transmitter to reduce the potential of losing desert tortoises.

26. The Marine Corps will ensure that desert tortoise exclusionary fencing complies with the Desert Tortoise Field Manual (Service 2009a). Fence material will be galvanized, one inch by two-inch vertical wire mesh and will incorporate tortoise-proof gates or cattle guards at all entry points. In instances where temporary exclusion of desert tortoises is required, the Marine Corps may use a temporary exclusion fence design after receiving approval by the NREA Division.

27. The Marine Corps will inspect all permanent desert tortoise exclusion fencing monthly and after rainfall events (i.e., the same day or the morning after an evening rain). The Marine Corps will inspect all temporary desert tortoise exclusion fencing monthly and after rainfall events. Repairs will occur on all damaged exclusion fencing within two days; temporary fencing will be used to close gaps until the permanent fencing is repaired. If monitoring identifies gaps in exclusion fencing that cannot be adequately closed by temporary fencing, the Marine Corps will post a biological monitor at the gap until fence repairs are made.

28. During fence installations, the Marine Corps will employ at least one biological monitor for each construction team, such that no driving, trenching, fence-pulling, or surface disturbance occurs without the presence of a biological monitor. The Marine Corps will supply these biological monitors with maps of burrows located during pre-project surveys to assist them in minimizing effects on desert tortoises. Biological monitors will have the authority to halt activities if a desert tortoise enters work areas, and they will contact an authorized biologist to move the animal out of harm's way prior to commencement of activities.

29. Following installation of any desert tortoise exclusion fence, the Marine Corps will ensure that an authorized biologist checks the fence alignment for desert tortoises that are exhibiting fence-pacing behavior. From April 1 to October 15 and during other unseasonably warm periods of the year, fence checks will occur two times daily for 2 weeks following completion of fence construction. If midday temperatures are likely to be above 40.6 degrees Celsius, one of these checks will occur one hour prior to the forecasted temperature high. If a given fence alignment is installed in the winter, inspections will occur three times per day for the first 3 weeks of the next active season.

30. Desert tortoises exhibiting fence-pacing behavior on construction and maintenance projects will be moved to a safe location away from the fence and monitored. If temperatures are above 35 degrees Celsius, an authorized biologist will construct an artificial burrow for the desert tortoise or hold it in a climate-controlled location until temperatures fall below 32.8 degrees Celsius and are expected to remain below 35 degrees Celsius for the remainder of that day.

31. When marking and flagging burrows, the Marine Corps will follow the guidance in the Desert Tortoise Field Manual (Service 2009a).

32. The Marine Corps will conduct surveys for desert tortoises in the earliest possible planning stages for construction and maintenance projects that require clearing of land within training areas. The Marine Corps will use the information gained from these surveys to reduce adverse effects to desert tortoises to the greatest extent practicable in the project plan.

33. For maintenance or construction projects outside of the Mainside Cantonment Area and in areas known to support desert tortoises, the Marine Corps will install temporary desert tortoise exclusion fencing around work sites and/or use biological monitors.

34. Prior to ground disturbance on maintenance and construction projects, an authorized biologist will perform pre-construction clearance surveys for desert tortoises. The authorized biologist will mark all desert tortoises moved from the construction site.

35. If a construction or maintenance project does not use desert tortoise exclusion fencing, the Marine Corps will ensure that clearance survey timing reduces the likelihood that a desert tortoise could enter a work area between the time of surveys and the onset of work. If desert tortoises are unlikely to be active, clearance surveys may occur within 48 hours prior to ground disturbance. The Marine Corps will determine whether desert tortoises are likely to be active based on the biology of the species, time of year, and weather conditions.

36. During pre-construction clearance surveys for construction and maintenance projects, the Marine Corps will inspect all desert tortoise burrows for small and large desert tortoises and all mammal burrows that may host large desert tortoises. The Marine Corps will flag and avoid all active burrows wherever feasible.

37. If construction activities cannot avoid an active burrow, an authorized biologist will excavate the burrow according to the protocols in the Desert Tortoise Field Manual (Service 2009a). Authorized biologists will move all desert tortoises excavated from active burrows to the nearest unoccupied natural burrow, an artificially constructed burrow, or place it under a shrub if it can be released within specified temperature limits. The Marine Corps will ensure that further construction activities do not disrupt the release location.

38. If an inactive burrow is near a construction or maintenance activity but in no danger of disturbance, the Marine Corps will block it and flag it for avoidance. The Marine Corps will follow the guidance provided in the Desert Tortoise Field Manual (Service 2009a) when blocking and marking the burrow. After completion of construction activities, the Marine Corps will remove materials used to block and flag the burrow. The Marine Corps will collapse all inactive burrows that construction activities are likely to disturb.

39. The Marine Corps will only confirm a burrow as inactive if close inspection can locate all interior edges of the burrow, such that hidden chambers are not missed.

40. On construction and maintenance projects that require biological monitoring, the biological monitors will work with the construction supervisor to minimize disturbance. The Marine Corps will ensure that an adequate number of biological monitors are present to monitor all aspects of the activities that have the potential to injure or kill desert tortoises. Biological monitors will have the authority to halt construction activities if they locate a desert tortoise in the construction area. The Marine Corps will cease all construction activity if they identify a desert tortoise within a construction area following initial clearance surveys. Construction activities will not resume until an authorized biologist has marked the desert tortoise and moved it to a safe location. The Marine Corps may forego the use of biological monitors in fenced construction areas where clearance surveys have occurred. MCAGCC biological staff will make this determination based on site-specific circumstances.

41. During construction in areas that are not fenced with desert tortoise exclusion fencing, biological monitors will check open trenches at least two times a day, in the morning and evening, throughout the duration of construction. If midday temperatures are likely to be above 35 degrees Celsius, one of these checks will occur one hour prior to the forecasted high temperature. The Marine Corps will leave open excavations only if they are temporarily fenced or covered to exclude desert tortoises. The Marine Corps will inspect all excavations for desert tortoises prior to filling.

42. The Marine Corps will require that personnel stake all camouflage netting 45.8 centimeters (18 inches) off the ground to prevent entanglement of desert tortoises.

43. The Marine Corps will prohibit accessing or departing the southeastern ranges of MCAGCC through the Cleghorn Lakes Wilderness Area. The Marine Corps will also prohibit access to Bullion or America Mine Training Ranges from a southerly direction. The Marine Corps will prohibit personnel from entering the Ord-Rodman Area of Critical Environmental Concern (ACEC) as part of training activities described in the proposed action, except for the purposes of implementing the translocation program.

44. The Marine Corps will take necessary steps to reduce effects to the desert tortoises caused by feral or free-roaming dogs at MCAGCC. These steps may include increased public awareness, cooperation with other agencies, and other methods of control.

45. The Marine Corps will prohibit pets within the MCAGCC training areas, with the exception of pets in the Mainside Cantonment Area and military working dogs that are under the control of their handler.

46. The Marine Corps will prohibit the possession of otherwise legal captive desert tortoises on any portion of MCAGCC, with the exception of animals used for desert tortoise awareness and education programs. The Marine Corps will prohibit the release of legal captive or wild desert tortoises from off base into the MCAGCC population.

47. The Marine Corps will prohibit the feeding of wildlife on MCAGCC.

48. The Marine Corps will prohibit recreational OHV use of the MCAGCC training areas, with the exception of those specifically identified above in the SUA or those on main or secondary supply routes.

49. The Marine Corps will prohibit the introduction of invasive plant species on MCAGCC.

50. The Marine Corps will prohibit unpermitted open fires and the harvesting or cutting of native vegetation, with limited exceptions within the SUA or as allowed for in MCAGCC's Integrated Natural Resources Management Plan.

Conservation Actions

The Marine Corps has proposed the following measures to address displacement of OHV recreation from the Johnson Valley OHV Area, to provide for improved management of public lands associated with translocation recipient sites, and to offset unavoidable effects of the proposed action. The project description consulted on in the 2012 biological opinion incorporated some of these actions. The Marine Corps has added additional actions since that time. The Marine Corps has coordinated with the Bureau on the development of actions that it would implement or fund on Bureau lands. Some actions have been approved by the Bureau and others may require further, site-specific consultation and approval by the Bureau prior to implementation.

Special Use Areas

Consistent with the 2012 biological opinion, the Marine Corps will establish or upgrade five Category 1 special use areas within the expansion areas and MCAGCC installation that will restrict mechanized maneuvers, off-road vehicle travel, bivouac sites, and any other military training involving off-road vehicle activity (see Figure 5). The Marine Corps will coordinate boundaries of individual special use areas with the Service. These areas include one special use area in the western expansion area (26.3 square kilometers), one special use area in the southern expansion area (11.9 square kilometers), one special use area in the Sunshine Peak Training Area (8.0 square kilometers), and the upgrading of an existing special use area in the Sunshine Peak and Lavic Training Areas that is contiguous with new ACEC lands (36.0 square kilometers). The

change in boundary between the EMUA and the SUA in the western expansion area that resulted from the 2014 NDAA affected one of the originally planned special use areas in the western expansion area. The Marine Corps has eliminated this special use area and replaced it with a 22.3 square kilometer special use area in the southern portion of the Bullion RTA, which has little disturbance, moderate to high desert tortoise densities, limited access, and is contiguous with the Cleghorn Lakes. The Marine Corps will install signs and fences along boundaries that face maneuver areas and the Johnson Valley OHV Management Area, to reduce the potential for effects from training activities and unauthorized access.

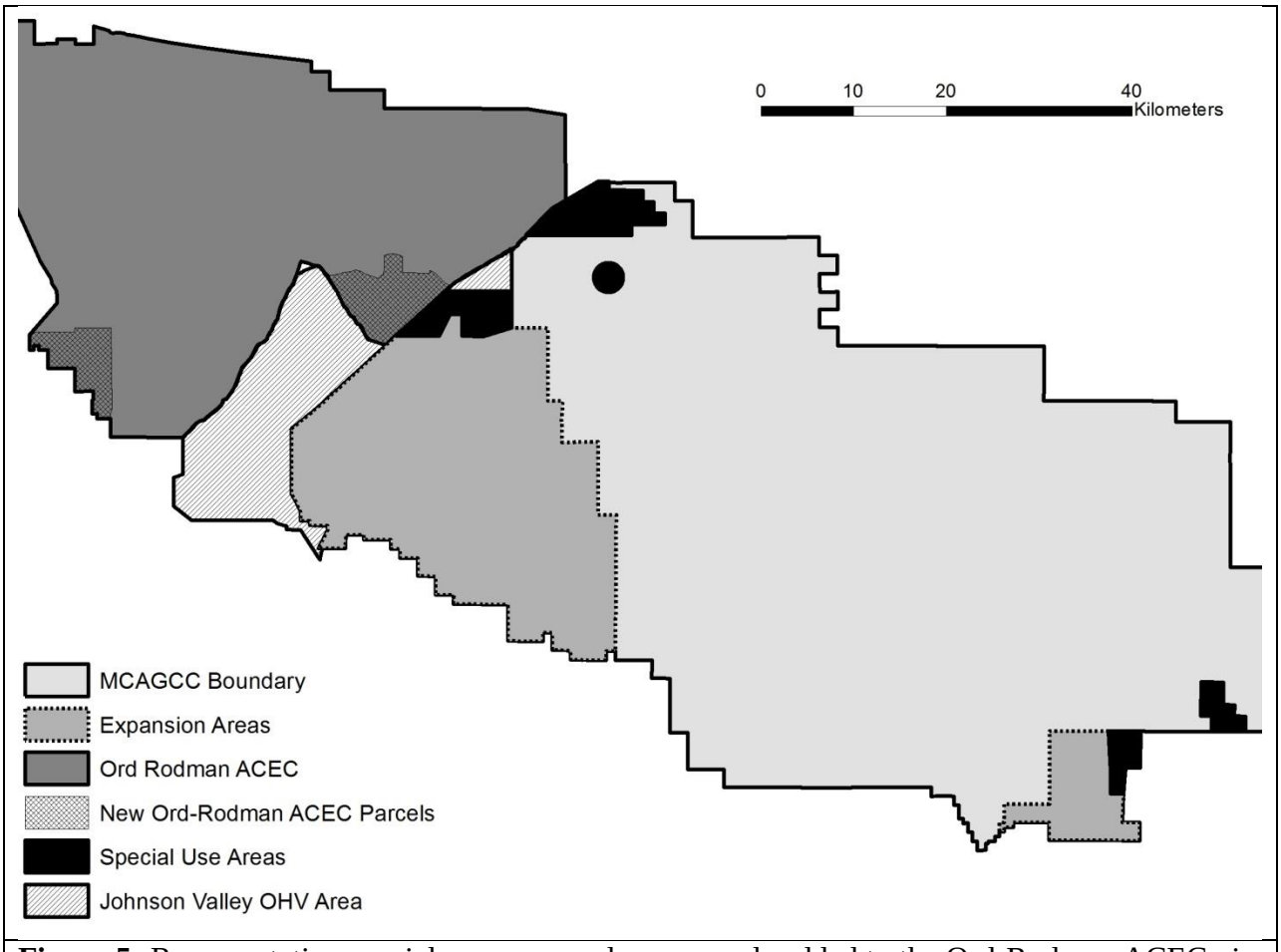


Figure 5: Representative special use areas and new parcels added to the Ord-Rodman ACEC via the Bureau's DRECP Land Use Plan Amendment (Bureau 2016)

Conservation Management of Adjacent Public Lands

In the 2012 biological opinion (Service 2012f) the Marine Corps committed to coordinate with and support the Bureau to develop the appropriate plans, agreements or other documents, such as an amendment to the California Desert Conservation Area Plan, to change the management of two adjacent parcels of land to be more protective of desert tortoises (DoN 2012b, 2012c). This

could have occurred by incorporating the parcels into the Ord-Rodman ACEC. The passage of the NDAA in 2014 required that one of these parcels, an isolated and disjunct 11.5 square kilometer portion of the former Johnson Valley OHV Area, remain open to OHV activity. This prevented incorporation of the area into the Ord-Rodman ACEC. However, the signing of the Record of Decision for the Desert Renewable Energy Conservation Plan (DRECP) Land Use Plan Amendment resulted in the incorporation of the other parcel, as well as an additional parcel (totaling 113.1 square kilometers) of Bureau lands, into the southeast and southwest portions of the Ord-Rodman ACEC (Bureau 2016; see Figure 5). We note that Bureau management of ACEC lands follows a multiple-use mandate, but with a stronger focus on conservation and a higher degree of management restrictions.

Law Enforcement

The Marine Corps will continue to implement its Conservation Law Enforcement Program with the purpose of patrolling and monitoring sensitive resource areas to curtail resource damage. The Conservation Law Enforcement Program enforces nine Federal conservation laws, including the provisions of the Act. The level of law enforcement since the 2012 biological opinion has increased, as the Marine Corps has implemented law enforcement patrols and convoys in the western expansion area. These patrols and convoys were initiated in the EMUA to deter public OHV trespass, and in the SUA to deter public OHV use when the SUA is closed, as well as prior to the eventual translocation of desert tortoises. Conservation Law Enforcement Officers (CLEOs) will also provide law enforcement patrols in the Ord-Rodman ACEC, subject to Federal law and Bureau authorization. The Marine Corps will coordinate with the Bureau to establish patrols in translocation recipient and control sites within the ACEC to curtail unauthorized land uses (e.g., off-route OHV travel). These patrols will occur ten times per year and will coincide with periods when desert tortoises are likely to be more active as well as peak OHV use periods. Patrols of the remaining ACEC areas will take place incidental to transit of CLEOs between sites. Aerial patrols via helicopter will also take place when flight hours are available. Helicopter patrols will avoid overflight of Wilderness, Wilderness Study Areas and active eagle nests.

Predator Monitoring and Targeted Control

The management of coyote and raven predation is a central part of the successful translocation of desert tortoises from the heavy- and moderate-disturbance areas. The Marine Corps has implemented and will continue policies at MCAGCC to reduce predator subsidies (e.g., water, food), and has partnered with the Service to examine the effectiveness of raven aversion techniques. The Marine Corps has also developed a predator management plan specific to this translocation that focuses on monitoring and control of coyote populations. The Marine Corps will monitor and document predator use of recipient and control sites and predation events on desert tortoises within the three populations monitored through the post-translocation monitoring program (see *Desert Tortoise Translocation* section below). Monitoring will be supplemented by CLEO patrols in the recipient and control sites in the Ord-Rodman ACEC.

If necessary, the Marine Corps will implement methods to target and remove offending coyotes from recipient and control sites within Bureau-managed lands and lands managed by the Marine Corps if predation rates of desert tortoises by coyotes exceed those of control populations, or if a predation event is identified using the thresholds established below[6]. The Marine Corps will also promote increased coyote hunting through an on-base hunter education program. CLEOs will target and remove offending coyotes incidental to normal patrols and as opportunities arise, in accordance with California state law. CLEOs will target specific coyotes in the recipient site for removal if the following criteria are met: 1) if canid predation in a recipient site exceeds that observed in the associated control site; 2) if canid predation of translocated desert tortoises in a recipient site exceeds that of the associated resident or control population; 3) if canid predation exceeds 10 percent of desert tortoises in a recipient site within a 1-year time frame; 4) if canid predation exceeds 3 percent of desert tortoises in a recipient site within a 30-day time frame. The Marine Corps will notify the Service when predator removal trigger points have been reached, and will coordinate with the Service to adaptively manage predator management over the life of the translocation program. In addition, to reduce the risk of predation within the Cleghorn constrained recipient site, the Marine Corps will implement its predator monitoring and control plan as described above, but with the added measure of focused CLEO monitoring of the site during the first month following translocation, with additional focused patrols conducted as possible during the 2-year period when the site will be fully enclosed.

The Marine Corps will monitor for common raven predation within the translocation recipient sites that are located within the Ord-Rodman ACEC and notify the Service of the location of common ravens that are preying on desert tortoises, so they can be removed through the Service's regional raven management program. The Marine Corps will seek a raven depredation permit so that it can perform direct removals of common ravens within the recipient sites.

Off-highway Vehicle Unauthorized Route Rehabilitation

The Marine Corps will coordinate with the Bureau to implement the following actions to prevent use of unauthorized routes that the Bureau has designated as closed routes within Bureau-managed translocation recipient sites and in specific areas of the Ord-Rodman ACEC as follows: 1) obscure and rehabilitate closed unauthorized routes within the recipient sites and dispersal areas located within the Ord-Rodman ACEC through use of vertical mulching or other means and 2) obscure and rehabilitate closed unauthorized routes within a 100-meter buffer of OHV barriers that separate the Johnson and Stoddard Valley OHV Management Areas from the Ord-Rodman ACEC.

Off-highway Vehicle Barriers

The Marine Corps will include in its budget funding for the installation of OHV barriers in the two fiscal years (fiscal years 2018 and 2019) following the signing of the Record of Decision for

[6] For targeted coyote removals, the Marine Corps will follow regulations set forth by the California Department of Fish and Wildlife.

the Supplemental Environmental Impact Statement (DoN 2016b) to reduce off-route travel in the Ord-Rodman ACEC. OHV barriers will not block Bureau designated routes. The final location of barriers may vary from the alignments proposed here to address private property and grazing allotment constraints, and are subject to Bureau authorization. The proposed OHV barriers would be installed at the following Bureau-approved locations (see Figure 6; numbers correspond to specific locations in Figure 6):

1. along the east side of Highway 247 between the Kern River Gas Line right-of-way and the location where Highway 247 reaches the base of Stoddard Ridge; the north end of this alignment, where it parallels the eastern boundary of the Stoddard Valley OHV Management Area, will incorporate desert tortoise exclusion fencing; fencing along Highway 247 will be preferentially placed within the California Department of Transportation (CalTrans) right-of-way, subject to CalTrans approval; the location of desert tortoise exclusion fencing will avoid conflicts with wildlife linkages identified in the DRECP.

2. along the Bureau ownership boundaries from Camp Rock Road at the southern end of the Ord-Rodman ACEC, west to a point where topography forms a barrier to OHV entry;

3. along the north side of Camp Rock Road from the southern boundary of the Ord-Rodman ACEC north to the Ord Mountain grazing allotment boundary; and

4. along the north side of the powerline road (BLM route number: NR 8465) from the isolated and disjunct portion of the Johnson Valley OHV Management Area (T6N, R4E, Section 4) to the larger portion of the Johnson Valley OHV Management Area (T6N, R3E, Section 13); the northern portion of this proposed alignment, along the boundary of the disjoint section of the Johnson Valley OHV Management Area, is provisional in nature because it overlaps with an active grazing allotment and its inclusion will require additional coordination with the Bureau.

For that portion of the Johnson Valley OHV Area boundary that falls within the grazing allotment, the Marine Corps will coordinate with the Bureau to identify mutually-agreeable measures to reduce off-route travel in the adjacent ACEC. The Marine Corps will be responsible for implementing these measures.

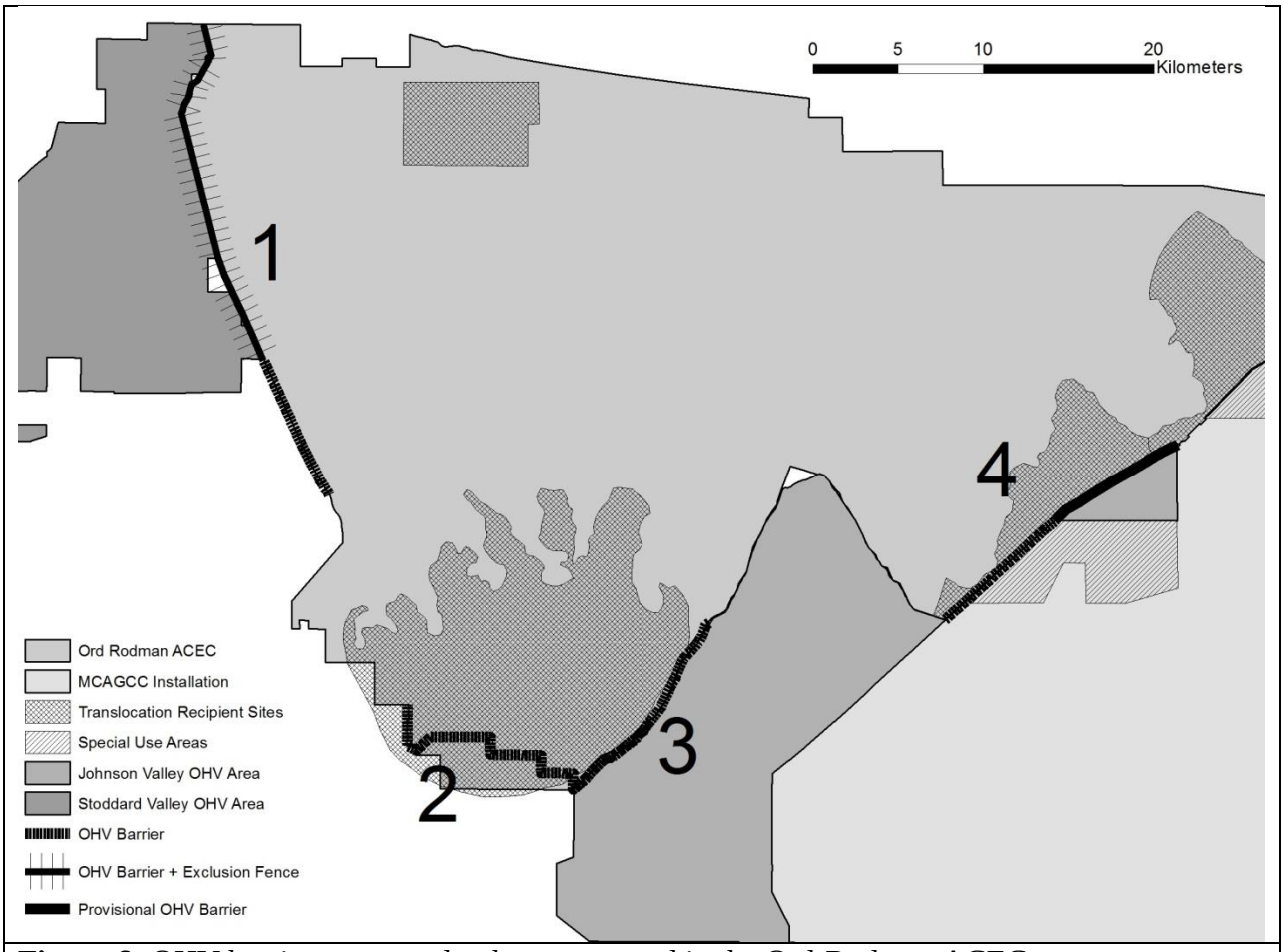


Figure 6: OHV barriers proposed to be constructed in the Ord-Rodman ACEC

Desert Tortoise Exclusion Fencing on the MCAGCC Installation

The Marine Corps will install desert tortoise exclusion fencing on lands managed by the Marine Corps at the interface of training areas with Galway Lake/Bessemer Mine special use area, Cleghorn Lake special use area, and the Siberia recipient site to reduce the potential for mortality of desert tortoises.

Identification of Illegal Trash and Dump Clean-ups and Habitat Restoration Sites

The Marine Corps will identify and notify the Bureau of illegal trash accumulation, dumps, and locations in need of habitat restoration within and on the periphery of the Ord-Rodman ACEC during CLEO patrols. Clean-up of the sites are subject to available funding.

Fence/Barrier Maintenance

The Marine Corps will coordinate with the Bureau to perform long-term maintenance of OHV barriers, desert tortoise exclusion fencing, and closed route rehabilitation areas that are implemented on public lands subject to future Bureau authorization such as a right-of-way or memorandum of understanding.

Funding of Line Distance Sampling

The Marine Corps will contribute funds to support the Service's range-wide monitoring efforts for the desert tortoise within the Ord-Rodman ACEC as a means of looking at how the effects of their translocation program and population augmentation fit into the broader context of population trends within the Ord-Rodman ACEC.

Desert Tortoise Translocation

We have summarized the following information from the Desert Tortoise Translocation Plan for the Marine Corps Air Ground Combat Center Land Acquisition (MCAGCC 2016b), which was developed to guide the translocation of desert tortoises from the high- and moderate-intensity disturbance areas in the western expansion area (WEA) and the southern expansion area (SEA). In cooperation with the Bureau, and pursuant to the National Environmental Policy Act, the Marine Corps prepared a Supplemental Environmental Impact Statement (DoN 2016b) to examine alternatives for the translocation of desert tortoises[7]. To inform this process, the Marine Corps completed 3 years of surveys, data collection and translocation-related activities, as required by the 2012 biological opinion (Service 2012f). These studies and activities have provided baseline data on the desert tortoise populations that reside within the proposed translocation recipient and paired control sites, and have been used to guide the development of the final translocation plan. The components of this research include the following, with further detail provided in subsequent sections:

1. analysis and refinement of the recipient and control sites that were proposed in the general translocation plan;

2. factors influencing desert tortoises in the proposed recipient and control sites, and in the WEA and SEA high- and moderate-intensity disturbance areas (e.g., desert tortoise densities, habitat analyses, baseline disease status and behavior, predation, and genetics analyses);

3. clearance surveys, radio transmittering, and *in situ* monitoring of desert tortoises in the WEA and SEA high- and moderate-disturbance areas;

[7] The translocation of desert tortoises requires final authorization from the Bureau; if circumstances occur that prohibit this authorization from being granted, re-initiation of formal consultation for the proposed action may be required.

4. construction of 186 individual holding pens at the Marine Corps' Tortoise Research and Captive Rearing Site (TRACRS); and

5. occupancy surveys and radio transmittering of resident desert tortoises in the proposed recipient and control sites.

The Marine Corps will translocate desert tortoises in accordance with the final translocation plan (MCAGCC 2016b) prior to initiating training activities in the high- and moderate-intensity disturbance areas (Figure 7). While the depiction of disturbance areas in Figure 7 provides information for assessing the potential effects of the translocation, the precise area where MEB objectives and other training-related disturbances would occur may change prior to commencement of training within the expansion areas. The Marine Corps will translocate all desert tortoises located within areas identified for heavy- and moderate-disturbance to a translocation recipient site as identified and supported by the final translocation plan. If changes to the MEB objective or other training-related disturbances cause an effect to the desert tortoise that we have not considered in this biological opinion, the Marine Corps may need to modify the translocation plan and re-initiate consultation as provided for in 50 Code of Federal Regulations (CFR) 402.16.

Translocation Recipient Sites

In the general translocation plan analyzed in the 2012 biological opinion (MCAGCC 2011), the Marine Corps identified seven proposed recipient sites with one alternative site to accommodate translocated desert tortoises from the WEA, and one recipient site with one alternative site to accommodate translocated desert tortoises from the SEA. In the final translocation plan (MCAGCC 2016b), the Marine Corps has modified and refined the list of proposed recipient sites, using site-specific data collected during the 3 years of pre-translocation research as well as data from external scientific studies and other projects, through collaboration with Federal and State agencies, and through investigations of current and future land uses. The Marine Corps proposes to use five recipient sites to accommodate desert tortoises translocated from high- and moderate-disturbance areas in the WEA and SEA, with six paired control sites (Table 1; Figure 8). Each recipient site includes a release area and a dispersal area[8], and each is paired with a control site or sites (see Table 1) with similar genetics, habitat, and local weather patterns. The proposed recipient sites include: Lucene-Ord, Rodman Sunshine Peak North, Siberia, Broadwell, and Cleghorn. The Lucerne-Ord, Siberia, and Broadwell sites are entirely within Bureau-managed lands, and the Rodman-Sunshine Peak North and Cleghorn sites overlap Bureau-managed lands and lands managed by the Marine Corps. The Daggett, Calico, Ludlow, and portions of the Rodman-Sunshine Peak South paired control sites are within Bureau-managed lands, and the Bullion, Cleghorn, and portions of the Rodman-Sunshine Peak South paired control sites are within lands managed by the Marine Corps. The Marine Corps has coordinated

[8] The "dispersal area" is the area of habitat surrounding the release area that some desert tortoises are likely to move into following release. It generally encompasses an area 6.5 kilometers from the edge of the release area with additional considerations made to remove locations that do not contain suitable habitat.

with the Bureau during the selection of recipient and control sites, and the Bureau preliminarily determined that use of these lands is appropriate for translocation of desert tortoises.

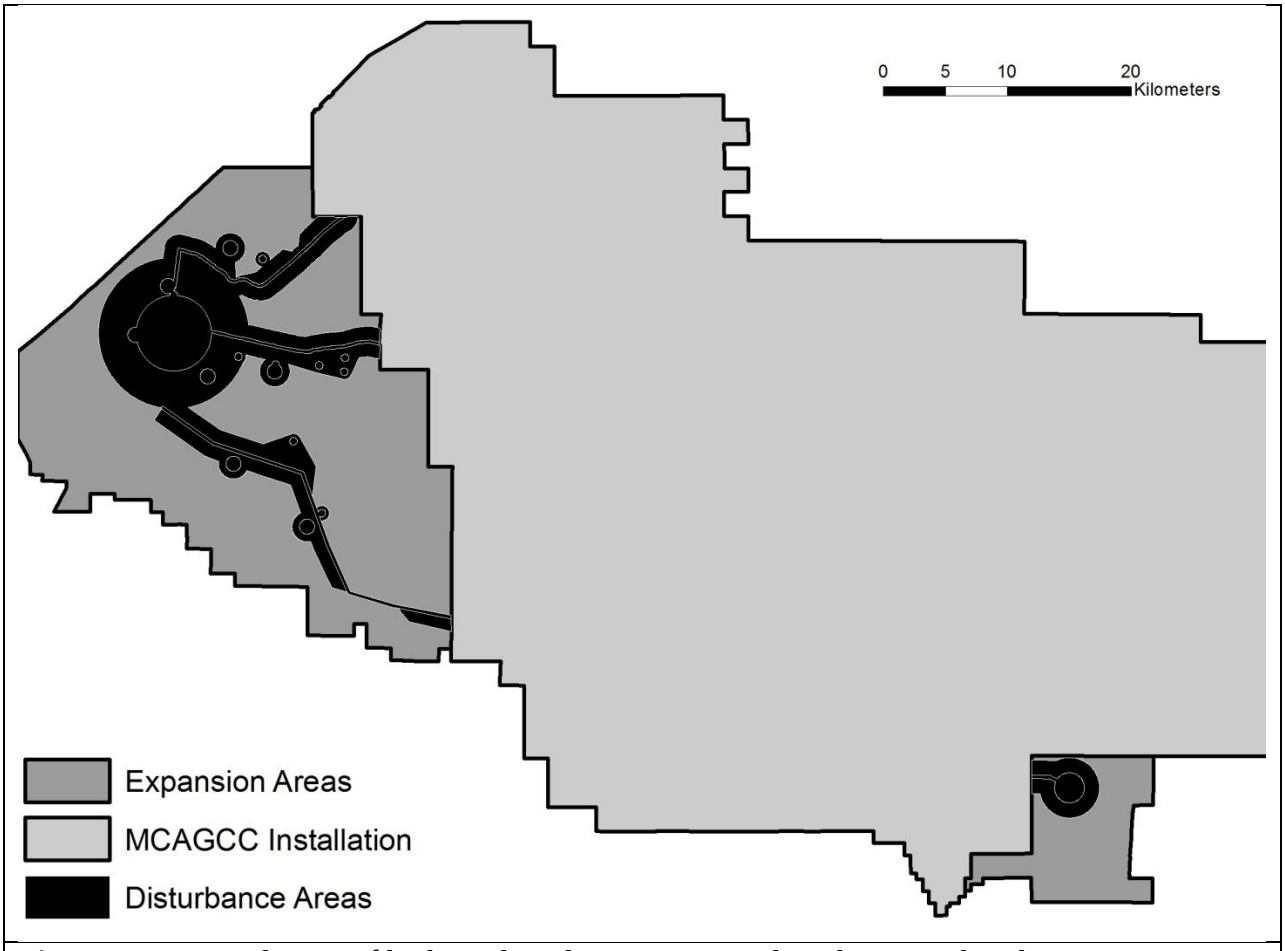


Figure 7: Proposed areas of high- and moderate-intensity disturbance within the expansion areas, where translocation of desert tortoises and future clearance surveys will occur

Table 1. Name and size of proposed recipient sites and paired control sites for desert tortoise translocation

Proposed Recipient Site	Size (square kilometers)	Paired Control Site	Distance From Paired Recipient Site[9] (kilometers)
Cleghorn Recipient	8.1	Cleghorn Control	3.0
		Bullion	5.6
Lucerne-Ord	162.5	Rodman Sunshine Peak South	NA
		Daggett	23
Rodman Sunshine Peak North	103.4	Rodman Sunshine Peak South	6.5
		Daggett	38
Siberia	39.6	Ludlow	5.8
Broadwell	52.4	Calico	3.3

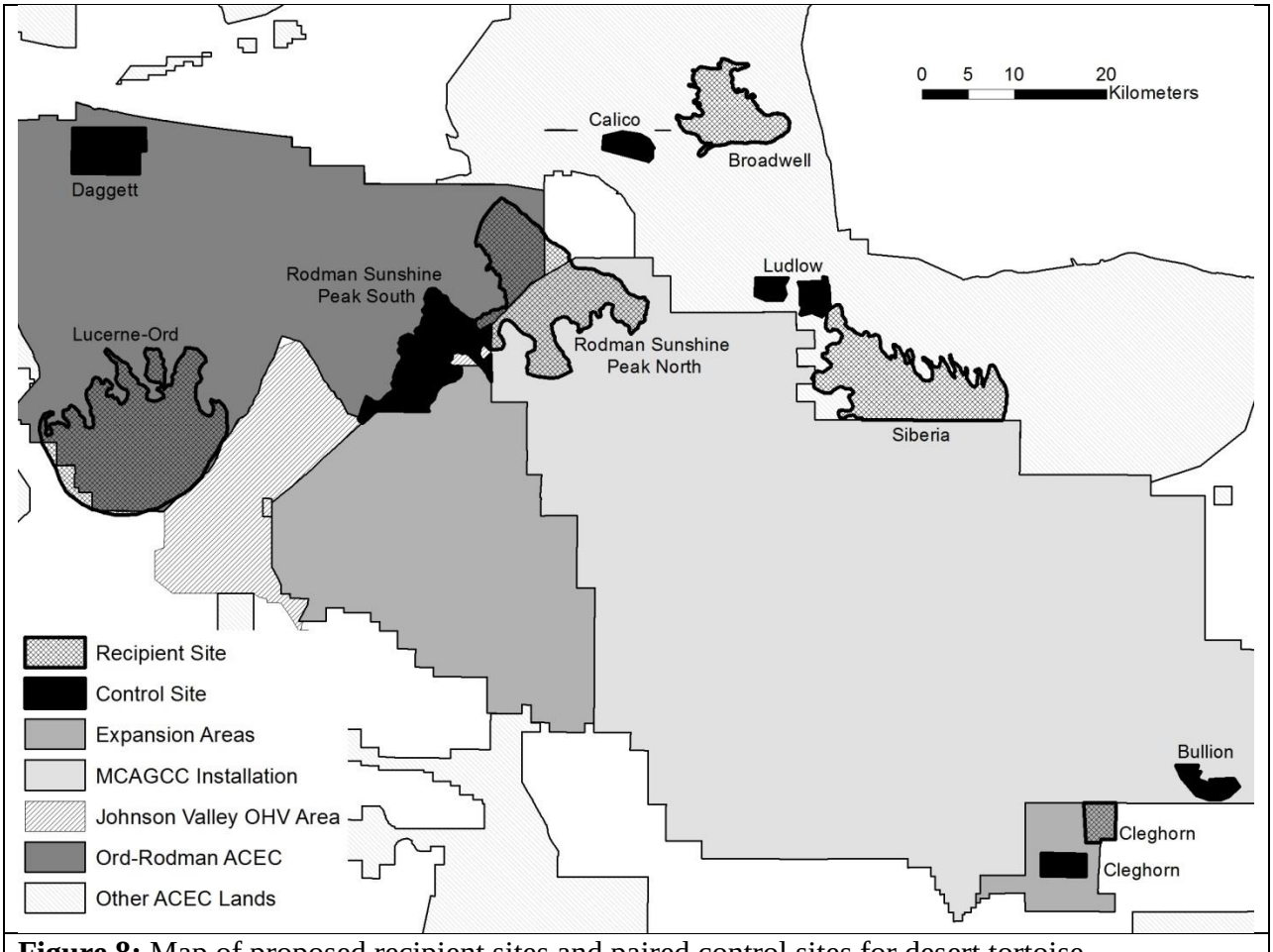


Figure 8: Map of proposed recipient sites and paired control sites for desert tortoise translocation

[9] Distance is from the edge of the release area.

The analysis of proposed recipient sites considered the Service's draft translocation guidance, which prioritizes translocation of desert tortoises to recipient sites that meet criteria for having depleted desert tortoise populations (Service 2016b). A site is considered to have a depleted desert tortoise population when population density is below 3.9 large[10] desert tortoises per square kilometer, or when a site is projected to have a population density fall to below 3.9 large desert tortoises per square kilometer within 3 years. This is based on the premise that desert tortoise population densities below 3.9 large desert tortoises per square kilometer are not viable in the long term (Service 1994). Other considerations taken into account during recipient site selection further reflect the Service's draft translocation guidance (Service 2016b) and include: 1) the presence of sufficiently good habitat that is part of a connected system of occupied desert tortoise habitat; 2) sites that are protected or receive adequate protection; and 3) sites that are not subject to heightened physical threats or intensive historic, current, or future land uses. The number of desert tortoises that will be translocated to respective recipient sites was determined using current recipient site densities, in a way that will experimentally examine whether areas of depleted populations can support higher densities of desert tortoises (Table 2).

Table 2. Recipient site densities and number of large (greater than 160 millimeter midline carapace length) desert tortoises to be translocated to each site

Recipient Site	Initial Density (tortoises per square kilometer)	Projected Density[11] (tortoises per square kilometer)	Tortoises to be Translocated	Post-Translocation Density (tortoises per square kilometer)
Cleghorn Recipient	6.5	5.2	37	10.4
Lucerne-Ord	5.2	4.0	447	8.1
Rodman-Sunshine Peak North	4.9	3.8	341	8.1
Siberia	2.6	2.1	155	5.5
Broadwell	5.1	4.1	18	5.5

In addition to these recipient sites, two areas were proposed as recipient sites in the 2011 General Translocation Plan (MCAGCC 2011) that are located in the Ord-Rodman ACEC. The Marine Corps has included these areas as alternative translocation sites under the No Action Alternative. In the event these areas are used as recipient sites, the Marine Corps will coordinate with the

[10] Many documents characterize desert tortoises as "adult," "subadult," or "juvenile." For the purposes of this biological opinion, we will generally reference size class as "large" (i.e., equal to or larger than 160 millimeters) and "small" (i.e., smaller than 160 millimeters) desert tortoises. The most recent translocation guidance (Service 2016b) recommends using 180 millimeter midline carapace length (MCL) as the threshold for large and small animals, however for this biological opinion we will use 160 millimeters as the threshold for the following reasons: 1) experience has shown that detection and survey efficacy rates are higher for desert tortoises larger than 160 millimeters in length during surveys, 2) desert tortoises in the 160 to 180 millimeter size class will reach reproductive age within approximately five to ten years, which make them valuable to future recruitment and to the long-term success of the translocation; 3) the surveys and research that began for MCAGCC in 2012, as well as recipient site selection and density determinations, were based on a 160 millimeter threshold; and 4) there is no statistical difference in recipient site density determinations when adjustments are made using 180 millimeters as the threshold (Henen 2016).

[11] Based on Service draft translocation guidance (2016); assumes an 8.3 percent decrease per year in tortoise density for the Lucerne-Ord and Rodman Sunshine Peak North recipient sites, and a 7.1 percent decrease per year in tortoise density for the remaining sites over three years.

Bureau and complete any necessary National Environmental Policy Act compliance, surveys, density estimates, and disease testing per Service translocation guidance (Service 2016b), to characterize the sites prior to the translocation of desert tortoises to these areas.

Translocation Process

Exclusion Fence Line Translocations - Prior to translocation of desert tortoises from the expansion areas, the Marine Corps will install permanent desert tortoise exclusion fencing in the following locations (see Figure 9): 1) between impact areas and recipient sites and/or special use areas to prevent desert tortoises from entering the impact areas; 2) between recipient areas and the open OHV use area north of the WEA; and 3) along the MCAGCC border at the Siberia recipient site, to prevent desert tortoises from entering MCAGCC. Temporary desert tortoise exclusion fencing will be installed at the constrained dispersal plot in the Cleghorn Lakes Range Training Area (RTA) to prevent desert tortoises from dispersing into the Cleghorn Lakes Wilderness. Exclusion fence materials and construction will comply with the most recent Service specifications (Service 2009a), and the Marine Corps will implement all relevant mitigation measures during fence construction.

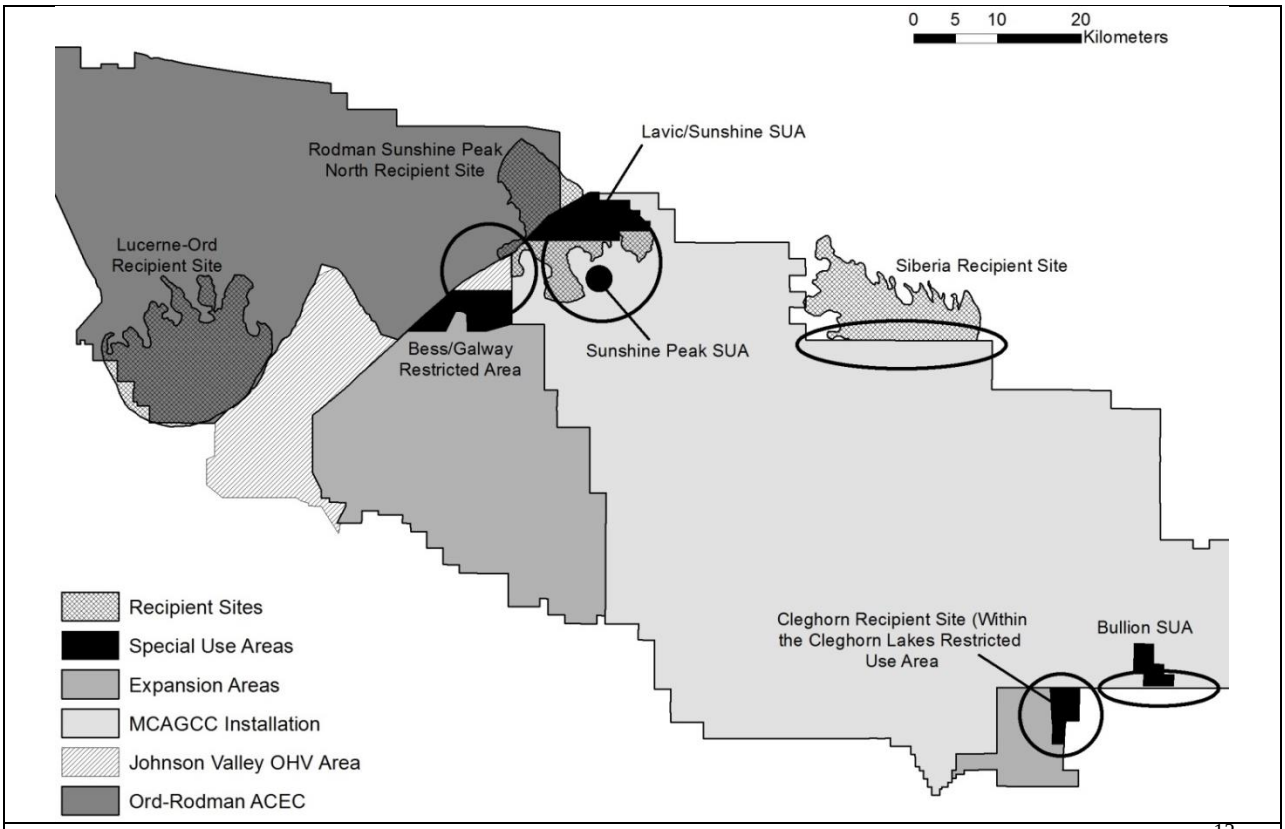


Figure 9: Proposed locations for permanent and temporary desert tortoise exclusionary fence[12]

[12] Final exclusionary fence locations may change depending on training scenarios, topography, and other factors.

Within 24 hours prior to exclusion fence installation, authorized biologists will perform 100-percent coverage surveys of the proposed fence alignment and a 13.7 meter (45 foot) buffer on either side of the alignment in accordance with the pre-project survey protocols (Service 2010a). Surveyors will identify, mark, and map all burrows that desert tortoises may use and determine occupancy status to the extent possible using reflective mirrors, tapping, probing, or fiber-optic scopes. The Marine Corps will use this information to adjust fence alignments to avoid active burrows or burrows over 0.5 meters in length by placing the fence between the burrow and the training area. For all other burrows (i.e., inactive or shorter than 0.5 meters) on the side of the fence within the training area, an authorized biologist will carefully excavate the burrow following Service protocol (2009a).

Desert tortoises located along installed exclusion fence lines in the expansion areas will become part of the translocation research study according to the following criteria. If the animal is fenced within the recipient site, it will become part of the recipient site resident population. Conversely, if a fence alignment places a given desert tortoise in a portion of the training area where translocation will occur, it will become part of the translocated population. If a fence alignment places a desert tortoise in a portion of the training area where training effects are unlikely to occur or be substantial (i.e., not within highly or moderately disturbed areas), it will not become part of the translocation research study. Following fence installation, if an animal exhibiting a substantial amount of fence pacing behavior is attempting to enter the recipient site during post-installation fence checks, an authorized biologist will place it within the recipient site and it will become part of the recipient site resident population.

Expansion Area Translocations - The Marine Corps plans to translocate approximately 1,138 large desert tortoises that are currently transmittered during the initial clearance surveys of the high- and moderate- disturbance areas of the WEA and SEA in the spring of 2017. An additional 285 small desert tortoises that were found during clearance surveys for translocation planning in the WEA and SEA were too small to be transmittered and are currently being cared for in the TRACRS facility. These individuals will be kept in the TRACRS facility until they are of adequate size to transmitter and translocate to a recipient site.

The Marine Corps will also perform additional clearance surveys of the high- and moderate-disturbance areas of the WEA and SEA prior to each MEB exercise and translocate any individuals that were not identified and transmittered over the last 3 years. Based on the survey efficacy estimations (Karl 2002), 74 percent of all desert tortoises in a site are likely to be found on a first survey pass, and 93 percent of all tortoises in a site are likely to be found after a second survey pass. Based on this estimation method, the Marine Corps predicts that an additional 82 large and 40 small desert tortoises may be found in the WEA and SEA during subsequent surveys and translocated to recipient sites.

The Marine Corps expects to translocate approximately 100 desert tortoises per day during the initial translocation, with a goal of completing the translocation by the end of the first week in April (or earlier if temperatures are unusually warm). Desert tortoises will be tracked via radio telemetry within one week prior to their scheduled translocation to establish their current

locations. On the day of translocation, authorized handlers will locate and capture each desert tortoise and transport it to a local processing center in a disinfected plastic bin with a lid covering the top. Each desert tortoise will receive a visual health assessment, and if any individual shows clinical signs of disease it is to be transported to the TRACRS facility and the Service notified.

Clearance Survey and Translocation Procedures

In addition to the *General Minimization Measures* identified above, the Marine Corps will implement the following measures during clearance surveys and translocation. Clearance survey requirements and protocols identified below apply to clearance of the heavy- and moderate-disturbance areas of the WEA and SEA. The Marine Corps will implement all other clearance surveys required within the expanded installation according the Service's standard clearance survey protocols as discussed in the *General Minimization Measures* section.

1. Prior to the initial clearance surveys of the WEA and SEA, the Marine Corps will divide the survey areas into 1-square kilometer grids.

2. Prior to the first MEB exercise, during a time of the year when desert tortoises are active, the Marine Corps will conduct the first clearance survey, covering 100 percent of the heavy- and moderate-disturbance areas, and carefully map where desert tortoises are found.

3. In subsequent years, during a time of year when desert tortoises are active, the Marine Corps will conduct additional clearance surveys of any 1-square kilometer grid where two or more large desert tortoises were found during the previous survey.

4. This procedure will continue until such time that fewer than two large desert tortoises are found in any grid, or until diminishing returns are met as determined in coordination with the Service.

5. The Marine Corps will utilize clearance survey transects that are spaced no more than 4.6 meters (15 feet) apart and will decrease the spacing of transects in areas of difficult terrain and dense vegetation. During the clearance survey prior to the start of a MEB exercise, the Marine Corps will not declare the area clear of desert tortoises until at least two consecutive clearance survey passes have found no new desert tortoises in the surveyed area. Consecutive clearance survey passes will occur at differing angles. During each pass, the Marine Corps will collect all desert tortoise scat. If fresh scat is discovered on a subsequent clearance survey pass, it will implement additional focused searches of the area where the scat was located. Desert tortoises encountered by chance in the clearance areas will also be moved to the nearest identified translocation recipient site.

6. During translocation clearance surveys, the Marine Corps will only excavate and collapse active desert tortoise burrows. To determine the need for excavation of burrows where occupancy cannot be verified, the Marine Corps will gate the burrow (i.e., place small

sticks along the entrance of the burrows) and use other means to determine use by desert tortoises during clearance survey passes. If disturbance of the gate during a subsequent clearance survey pass indicates an occupied burrow, the Marine Corps will investigate it further. If this occurs during the final clearance surveys, in which desert tortoises are moved to the translocation area, an authorized biologist will excavate the burrow.

7. For any desert tortoise found during clearance surveys, the standard measurements and health assessments collected on individuals associated with the translocation will be completed and the desert tortoise will be marked with identification.

8. The Marine Corps will notify the Service when additional desert tortoises are located within the heavy- and moderate-disturbance areas of the WEA or SEA during clearance surveys, and will monitor them *in situ* or in the TRACRS facility until ELISA or qPCR analysis results are received. All desert tortoises that are suitable candidates for translocation, based on the health assessment, will be translocated to a designated recipient site in accordance with the approved disposition plan for each desert tortoise and in accordance with draft translocation guidance (Service 2016b).

9. The Marine Corps will transfer located desert tortoises that are too small (midline carapace length less than approximately 120 millimeters) to be transmittered to its TRACRS facility or to a similar temporary enclosure in a special use area. Temporary enclosures will be small, approximately nine square meters, will enclose native food and refuge vegetation and suitable soil for burrowing, and will use a predator-proof design similar to holding pens in the TRACRS facility. The predator-proof design will use four 3.1 meter-long (10-foot) chain-link panels, fitted with metal flashing and hardware cloth bent to prevent predator entry by digging underneath, and nylon or polypropylene netting to exclude avian predators. These animals will become part of the Marine Corps' existing desert tortoise head-starting program or remain quarantined in predator-proof pens for later release into the identified recipient site.

10. For individuals in temporary enclosures, the Marine Corps will monitor these smaller desert tortoises and any hatchlings once a month until late November. At the end of this period, if the Marine Corps does not incorporate the individuals into its existing headstarting program, it will remove the predator-proof enclosure, permit passive translocation, or actively translocate the hatchlings to rodent burrows away from the enclosures, depending on common raven and other predator activity at or near the enclosures.

11. During translocation, the Marine Corps will comply with the draft translocation guidance (Service 2016b) unless specifically modified by this biological opinion or more recent guidance agreed to by the Marine Corps and the Service.

12. Desert tortoises captured will be translocated to the most appropriate recipient site given the conditions within recipient sites at the time of capture, as determined in coordination

with the Service and Bureau if the recipient site is located on public lands, and subject to standard health assessment results and restrictions on translocation of ELISA-seropositive desert tortoises into critical habitat.

13. Depending on environmental conditions and hydration states, desert tortoises to be translocated may need to be hydrated within 12 hours before release, according to existing protocols (Service 2009a). This may include soaking in shallow clean drinking water, nasal/oral administration of clean drinking water, or epicoelomic[13] injection of sterile saline.

14. Radio transmitters will be removed from desert tortoise individuals that will not be part of the post-translocation research. All standard Service field protocol will be followed when handling desert tortoises (Service 2009a).

15. The Marine Corps will translocate desert tortoises only when ambient temperatures will not exceed 35°C within one week of release and 32°C within three hours of release.

16. The Marine Corps will release all translocated desert tortoises under shrubs or other forms of shelter (e.g., rock caves).

Post-translocation Effectiveness Monitoring

The final translocation plan submitted by the Marine Corps was developed using the following effectiveness monitoring methods to evaluate whether the translocation program achieves its long-term goals of maximizing survival and assimilation of translocated desert tortoises within their new habitat and populations. Further, health assessments conducted on desert tortoises throughout the effectiveness monitoring program will generate important information about the short- and long-term disease dynamics related to translocation.

Radio Tracking - The Marine Corps will evaluate the survival of translocated, resident, and control desert tortoises through the radio tracking of 675 telemetered desert tortoises, a sample comprised of 225 desert tortoises each from the translocated, resident, and control populations. A sample size of 225 from each group represents approximately 20 percent (190 individuals) of large desert tortoises and 5 percent (35 individuals) of small desert tortoises originally anticipated to be translocated from the WEA and SEA. Translocated, resident, and control desert tortoises will be tracked during the first year according to the schedule in the Service's 2010 translocation guidance (Service 2010e). We anticipate that translocated individuals will settle somewhat into new home ranges within 1 year following translocation (Nussear 2004, Field et al. 2007), after which time the Marine Corps will monitor less frequently. This reduced schedule will consist of weekly tracking during the desert tortoise active season (April, May, the last half

[13] Rehydration via epicoelomic injection consists of subcutaneous injection of sterile saline to a location between the coelomic cavity and shell; this technique has the benefit of providing a known amount of fluid replacement to a desert tortoise.

of September and October), every 2 weeks during the summer less active season (June through the first half of September), and monthly during the winter inactive season (November through March).

After 5 years of radio tracking, the transmittered group of desert tortoises will be decreased to 50 individuals per group (translocated, resident, and control: 150 individuals total) and monitored via radio tracking for 5 additional years at the reduced monitoring schedule above. At the end of this 5-year period, transmitters will be removed from all desert tortoises unless the Marine Corps and resource management agencies determine that additional monitoring is necessary.

Mark-recapture Plots - Following translocation of desert tortoises, the Marine Corps will monitor a subset of the translocated population for up to 30 years to determine the effectiveness of the translocation effort and to adaptively manage the effort as needed. Effectiveness monitoring will examine survival, assimilation, demography, and population health status, as well as identify threats to the translocation area, and measure habitat stability and changes, through a combination of mark-recapture plots and tracking. In addition to monitoring the translocated population of desert tortoises, the Marine Corps will monitor the resident and control desert tortoise populations on the recipient and paired control sites, respectively.

The Marine Corps will repeatedly evaluate mark-recapture plots at recipient and paired control sites to help monitor the survival of both translocated and resident desert tortoises. These plot analyses will also provide estimates of population density and demography (e.g., sex and age structure), and support planned measures of site fidelity, health assessments, and other variables such as habitat condition and health parameters that may determine or help explain the survival of desert tortoises at recipient and paired control sites. These plots, especially control plots, will also provide a general reference for population monitoring in the broader area.

Twelve, 1-square kilometer plots will be established in the recipient and control areas, with seven in recipient areas and five in control sites. Each plot will be surveyed for population density and structure every 5 years for 30 years, an interval consistent with Strategy 4 of the Service's revised desert tortoise recovery plan (Service 2011c). Standard mark-recapture techniques (e.g., Lincoln-Peterson) will be employed, with at least two passes conducted, and all captured tortoises will be weighed, measured, photographed, sexed, and described. The Marine Corps will also conduct health assessments, collect blood tissue samples for ELISA testing and oral tissue samples for qPCR analysis, and ensure proper storage of all sample residues for future genetic analysis. Proper long-term storage of residue samples includes either of the following: 1) shipment of samples to the Service's sample bank at the University of California, Los Angeles per the most current Service health assessment procedures and guidelines (Service 2016c); or 2) the on-site storage of samples, with the requirement that all storage and cataloging protocols are met, per coordination with the Service.

During each survey of the mark-recapture plots, the Marine Corps will assess habitat to monitor changes or stability. Standardized transects will be used to measure percent ground cover, density, frequency, species richness, species evenness, and robustness of perennial plants. On the

same transects, hydrology, annual plant species (percent cover and biomass by species), substrates, and soils will be measured on stratified-random quadrats. All annual plants present on each transect, including all desert tortoise forage species, will be inventoried. Exotic annual plants will be measured to document spread and population increases. Surface disturbance will be measured by type and age. Perennial plants, soils, substrates, and hydrology will be measured every 10 years for 30 years. Annual plants and surface disturbance will be measured every 5 years on all plots. Biomass will be measured on a subset of the mark-recapture plots every 5 years.

The Marine Corps will quantify predator use within the plots, with species, abundance, and distribution documented. Raven numbers (individuals and nests) will be recorded and the area below nests of both ravens and large raptors will be surveyed for desert tortoise remains. The Marine Corps will also document and describe OHV use, evidence of free-ranging dogs and/or coyotes, and any other unforeseen developments that may affect the overall success of the translocation.

Dispersal Area Monitoring - The mark-recapture plots will provide additional monitoring of the translocated, resident, and control desert tortoise groups, however since these plots are limited to 12 localized study sites the Marine Corps will supplement this effort by conducting density transects over the dispersal areas within each recipient site. This will allow the acquisition of survival data over large areas of the recipient sites, will increase the number of desert tortoises found within the recipient sites, will improve density estimates, and will improve quantification of predator use and anthropogenic disturbance within the recipient sites. The Marine Corps will survey line transects 1-kilometer to 12-kilometers long, spaced over the recipient and paired control sites. Depending on tortoise density and the size of the dispersal area, there may be as many as 5 to 10 transect passes per square kilometer. Rain gauges will be installed at each site to monitor precipitation, and more sophisticated weather stations may be installed at more protected sites to augment the weather dataset.

Rodman-Sunshine Peak North - Due to ongoing military use of and limited access to the Rodman-Sunshine Peak North recipient site, the Marine Corps proposes a combination of transect surveys for desert tortoise density, mark-recapture plots, and radio tracking to monitor survival, population density, health status, and habitat quality in the site. For the first 3 years, a series of line transect surveys will be conducted across the broader dispersal area to: 1) estimate desert tortoise population density for the dispersal area and 2) collect data on as many translocated and resident desert tortoises as possible in the Sunshine Peak site. This will enable the Marine Corps to find translocated and resident desert tortoises and allow for health assessments to be conducted on all individuals, and for increasing sample sizes and statistical power for the data analyses. After this 3-year period the data from the surveys will be analyzed to determine if there are suitable mark-recapture plot locations for long-term (e.g., 5-year interval) monitoring, or if monitoring should be maintained via the line transect density surveys. The Marine Corps anticipates access into this site at least two times per year, and will attempt to schedule additional access to the site to support monitoring via radio tracking. However, if additional access proves infeasible, radio transmitters attached to desert tortoises within the site

will be removed to prevent transmitters from failing due to battery life and remaining on desert tortoise individuals. The Marine Corps will consider using Global Positioning System (GPS), satellite, or cellular transmitter technology for monitoring in this site when the technology becomes suitable to not compromise desert tortoise survival.

Post-translocation Research

The Marine Corps has designed the translocation and effectiveness monitoring programs to generate useful scientific data that can be used to address research topics about how translocation affects desert tortoises over a long-term timeframe. These research topics include: 1) experimental translocation densities; 2) cattle grazing compatibility with desert tortoises; 3) efficacy of constrained dispersal for species recovery; 4) effects of translocation distance; and 5) efficacy of headstarting as a translocation tool. We have summarized these research topics from the Marine Corps' final translocation plan; for details on experimental design and statistical analysis, see MCAGCC (2016b).

Experimental Translocation Densities - The primary emphasis of the translocation density analysis is to evaluate whether areas with depleted desert tortoise populations can support population densities higher than existing densities. The Marine Corps will experimentally test translocation density increases that are 0.7SE (1.4 large desert tortoises per square kilometer) to 2.6SE (5.2 large desert tortoises per square kilometer), or 34 percent to 100 percent, higher than existing site densities. Within the context of translocation density tests for recipient sites, the Marine Corps will also consider variation due to other categorical or continuous variables (e.g., sex, age, size, health status, habitat condition, rainfall, or indices of predator abundance). Finally, the Marine Corps will evaluate how site density influences: 1) genotypic assimilation[14], examining clutch paternities and genetic distances of offspring relative to the resident and translocated population baselines (genetic diversity and genetic distance from residents); and 2) phenotypic variation[15], examining differences in movements, home range size and overlap, and site fidelity between translocated and resident desert tortoises.

Cattle Grazing Compatibility with Desert Tortoises – To help fill knowledge gaps that exist in understanding the effects that cattle grazing might have on desert tortoises, the Marine Corps will measure the same basic survival and assimilation factors through radio tracking, mark-recapture, plot density assessments, dispersal area evaluations, health assessments, habitat characteristics, and other monitoring methods indicated above. These analyses will compare data among the translocated, resident, and control desert tortoise populations, within grazed and un-grazed areas.

[14] Genotypic assimilation refers to the degree of mixing of different genotypes and phenotypes between translocated animals and resident animals (see Averill-Murray and Hagerty 2014).
[15] Phenotypic variation consists of the differences and/or similarities in physical characteristics between translocated and resident animals.

Efficacy of Constrained Dispersal for Species Recovery – The Marine Corps will examine whether the technique of constrained dispersal, in which desert tortoises are translocated to and remain within a fenced site for some specified period of time before the fence is removed, provides a more targeted approach to population augmentation of specific areas. As opposed to translocation to unfenced sites where desert tortoises may migrate away from a site, individuals within constrained sites might remain in that localized area once fences are removed because they have established home ranges and have become part of the social hierarchy alongside resident desert tortoises. In this way, specific locations can be targeted for population augmentation, in a way consistent with the Service's current draft translocation guidance (Service 2016b).

The Cleghorn recipient site will serve as the constrained site for this translocation, and the number of desert tortoises translocated to this site will achieve post-translocation densities that approximate higher historic densities. The Marine Corps will install temporary desert tortoise exclusion fencing along the eastern edge of the site, with permanent fencing along the remainder of the site. All tortoises in the constrained dispersal study will be radio transmittered and monitored for survival, assimilation, movements, home ranges, health, disease, and additional explanatory variables (e.g., demographics, predator indices, and weather), in a manner identical to the methods and schedule identified in the effectiveness monitoring program. Radio tracking will follow the schedule for all other transmittered tortoises in the translocation program. The Marine Corps will remove the desert tortoise exclusion fencing 2 years after initial translocation in order to permit desert tortoises within the constrained site to mix within the broader population. Repatriation will be assessed by continued monitoring of subsequent desert tortoise movements and by comparing these to movement patterns and ranges of control individuals at the Cleghorn control site. Radio tracking will end after 10 years, consistent with the time period of radio tracking on the larger transmittered group of desert tortoises.

Effects of Translocation Distance - Translocation risks mixing desert tortoises with different genotypes (Averill-Murray and Hagerty 2014) and phenotypes, although the former is typically emphasized when evaluating translocations. In this translocation, the Marine Corps will evaluate both over a relatively short distance (<100 kilometers). The analysis will examine the effect of translocation distance on the degree of assimilation of translocated desert tortoises within the various resident populations. The effectiveness monitoring program will provide data that can be analyzed for patterns of mixing or segregation within desert tortoise populations, and DNA sampling will allow for testing to determine whether clutches produce offspring that are mixed or segregated among the translocated and resident populations. This research will quantify the amount of genetic mixing that occurs over time.

Efficacy of Headstarting as a Translocation Tool – The ongoing operation of the TRACRS headstart facility will enable the Marine Corps to house desert tortoises that are too small to be fitted with radio transmitters (generally less than midline carapace length of 120 millimeters), and are at higher risk of predation due to their small size, until they have grown to an adequate size to be released into recipient sites. This also enables the Marine Corps to capture and hold small desert tortoises that are found during past clearance surveys that would be difficult to

locate and capture in future clearance surveys. Very little is known about the survival of small desert tortoises in the wild, and the effectiveness monitoring data collected at the TRACRS facility and following translocation will enable research on the efficacy of headstart methods over a long-term timeframe.

The Marine Corps will measure and analyze the same survival, dispersal, movement, behavior, growth, and health data for comparing adults and juveniles in the initial translocation. Assimilation measures will be limited to phenotypic factors as small desert tortoises are not reproductive. Similar levels of monitoring may be used for additional cohorts of the headstarted small desert tortoises, and some individuals may be released to recipient sites without transmitters after they have reached a midline carapace length of 100-120 millimeters. Following the effectiveness monitoring methods described above, the Marine Corps will document survival and other relevant data for these headstarted individuals when they are opportunistically located during mark-recapture and density surveys.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed Federal action, and any cumulative effects, on the range-wide survival and recovery of the listed species. It relies on four components: 1) the *Status of the Species*, which describes the range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; 2) the *Environmental Baseline*, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and 4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the species.

STATUS OF THE DESERT TORTOISE

The Service listed the desert tortoise as threatened in 1990 (55 Federal Register 12178). The threats described in the listing rule and both recovery plans continue to affect the species. The most apparent threats to the desert tortoise are those that result in mortality and permanent habitat loss across large areas, such as urbanization and large-scale renewable energy projects, and those that fragment and degrade habitats, such as proliferation of roads and highways, OHV activity, and habitat invasion by non-native invasive plant species.

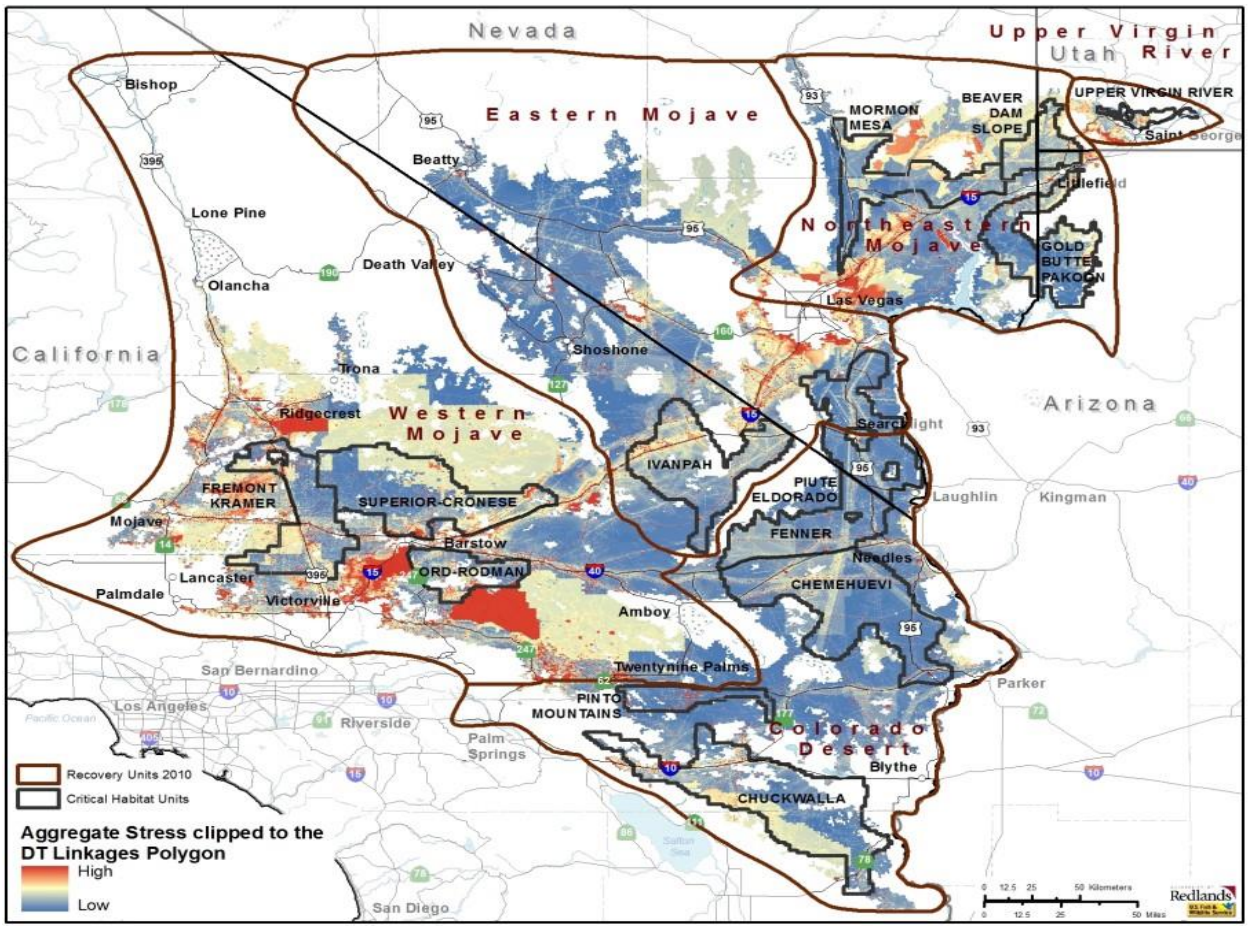
We remain unable to quantify how threats affect desert tortoise populations. The assessment of the original recovery plan emphasized the need for a better understanding of the implications of multiple, simultaneous threats facing desert tortoise populations and of the relative contribution of multiple threats on demographic factors (i.e., birth rate, survivorship, fecundity, and death rate; Tracy et al. 2004).

In recognition of the absence of specific and recent information on the location of habitable areas of the Mojave Desert, especially at the outer edges of this area, Nussear et al. (2009) developed a quantitative, spatial habitat model for the desert tortoise north and west of the Colorado River. The model incorporates environmental variables such as precipitation, geology, vegetation, and slope and is based on occurrence data of desert tortoises from sources spanning more than 80 years, including data from the 2001 to 2008 range-wide monitoring surveys. The model predicts the relative potential for desert tortoises to be present in any given location, given the combination of habitat variables at that location in relation to areas of known occupancy throughout the range; calculations of the amount of desert tortoise habitat in the 5-year review (Service 2010b) use a threshold of 0.5 or greater predicted value for potential desert tortoise habitat. The model does not account for anthropogenic effects to habitat and represents the potential for occupancy by desert tortoises absent these effects.

To understand better the relationship of threats to populations of desert tortoises and the most effective manner to implement recovery actions, the Desert Tortoise Recovery Office developed a spatial decision support system that models the interrelationships of threats to desert tortoises and how those threats affect population change. The spatial decision support system describes the numerous threats that desert tortoises face, explains how these threats interact to affect individual animals and habitat, and how these effects in turn bring about changes in populations. For example, in the case of transmission lines we have long known that the construction of these structures can result in the death of desert tortoises and loss of habitat. We have also known that common ravens, known predators of desert tortoises, use the transmission line's pylons for nesting, roosting, and perching and that the access routes associated with transmission lines provide a vector for the introduction and spread of invasive weeds and facilitate increased human access into an area. Increased human access can accelerate illegal collection and release of desert tortoises and their deliberate maiming and killing, as well as facilitate the spread of other threats associated with human presence, such as vehicle use, garbage and dumping, and invasive plants (Darst 2012). Changes in the abundance of native plants because of invasive weeds can compromise the physiological health of desert tortoises, making them more vulnerable to drought, disease, and predation. The spatial decision support system allows us to map threats across the range of the desert tortoise and model the intensity of stresses that these multiple and combined threats place on desert tortoise populations.

The following map depicts the 12 critical habitat units of the desert tortoise, linkages between conservation areas for the desert tortoise and the aggregate stress that multiple, synergistic threats place on desert tortoise populations, as modeled by the spatial decision support system. Conservation areas include designated critical habitat and other lands managed for the long-term

conservation of the desert tortoise (e.g., the Desert Tortoise Natural Area, Joshua Tree National Park, and the Desert National Wildlife Refuge).



Recovery Plan

The Service (1994, 2011c) has issued an initial recovery plan and a revised recovery plan for the desert tortoise. The 1994 recovery plan recommended that a scientifically credible monitoring plan be developed to determine that the population exhibit a statistically significant upward trend or remain stationary for at least 25 years and that enough habitat would be protected within a recovery unit or the habitat and populations be managed intensively enough to ensure long-term viability. Because both minimum population densities and minimum population numbers need to be considered to ensure recovery, the Service further recommended that reserves be at least 1,000 square miles. Smaller reserves that provide high-quality, secure habitat for 10,000 to 20,000 adult desert tortoises should provide comfortable persistence probabilities for the species well into the future when populations are well above minimum viable density (e.g., 30 or more adults per square mile) and lambdas can be maintained (see page C54 of Service 1994). Conversely, populations with densities below approximately 10 adults per square mile (3.9 per square kilometer) are in danger of extinction (see page 32 of Service 1994).

The revised recovery plan for the desert tortoise (Service 2011c) lists three objectives and associated criteria to achieve delisting. The first objective is to maintain self-sustaining populations of desert tortoises within each recovery unit into the future; the criterion is that the rates of population change (λ) for desert tortoises are increasing (i.e., $\lambda > 1$) over at least 25 years (i.e., a single generation), as measured by extensive, range-wide monitoring across conservation areas within each recovery unit, and by direct monitoring and estimation of vital rates (recruitment, survival) from demographic study areas within each recovery unit.

The second objective addresses the distribution of desert tortoises. The goal is to maintain well-distributed populations of desert tortoises throughout each recovery unit; the criterion is that the distribution of desert tortoises throughout each conservation area increase over at least 25 years.

The final objective is to ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations. The criterion is that the quantity of desert tortoise habitat within each conservation area be maintained with no net loss until population viability is ensured.

The revised recovery plan (Service 2011c) also recommends connecting blocks of desert tortoise habitat, such as critical habitat units and other important areas to maintain gene flow between populations. Linkages defined using least-cost path analysis (Averill-Murray et al. 2013) illustrate a minimum connection of habitat for desert tortoises between blocks of habitat and represent priority areas for conservation of population connectivity. The previous map in this biological opinion illustrates that, across the range, desert tortoises in areas under the highest level of conservation management remain subject to numerous threats, stresses, and mortality sources.

Five-year Review

Section 4(c)(2) of the Endangered Species Act requires the Service to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether the species' status has changed since it was listed (or since the most recent 5-year review); these reviews, at the time of their completion, provide the most up-to-date information on the range-wide status of the species. For this reason, we are appending the 5-year review of the status of the desert tortoise (Appendix 1; Service 2010b) to this biological opinion and are incorporating it by reference to provide most of the information needed for this section of the biological opinion. The following paragraphs provide a summary of the relevant information in the 5-year review.

In the 5-year review, the Service discusses the status of the desert tortoise as a single distinct population segment and provides information on the Federal Register notices that resulted in its listing and the designation of critical habitat. The Service also describes the desert tortoise's ecology, life history, spatial distribution, abundance, habitats, and the threats that led to its listing (i.e., the five-factor analysis required by section 4(a)(1) of the Endangered Species Act). In the 5-

year review, the Service concluded by recommending that the status of the desert tortoise as a threatened species be maintained.

With regard to the status of the desert tortoise as a distinct population segment, the Service concluded in the 5-year review that the recovery units recognized in the original and revised recovery plans (Service 1994 and 2011c, respectively) do not qualify as distinct population segments under the Service's distinct population segment policy (61 Federal Register 4722; February 7, 1996). We reached this conclusion because individuals of the listed taxon occupy habitat that is relatively continuously distributed, exhibit genetic differentiation that is consistent with isolation-by-distance in a continuous-distribution model of gene flow, and likely vary in behavioral and physiological characteristics across the area they occupy as a result of the transitional nature of, or environmental gradations between, the described subdivisions of the Mojave and Colorado deserts.

In the 5-year review, the Service summarizes information with regard to the desert tortoise's ecology and life history. Of key importance to assessing threats to the species and to developing and implementing a strategy for recovery is that desert tortoises are long lived, require up to 20 years to reach sexual maturity, and have low reproductive rates during a long period of reproductive potential. The number of eggs that a female desert tortoise can produce in a season is dependent on a variety of factors including environment, habitat, availability of forage and drinking water, and physiological condition. Predation seems to play an important role in clutch failure. Predation and environmental factors also affect the survival of hatchlings. The Service notes in the 5-year review that the combination of the desert tortoise's late breeding age and a low reproductive rate challenges our ability to achieve recovery.

Since the completion of the 5-year review, the Service has issued several biological opinions that affect large areas of desert tortoise habitat because of numerous proposals to develop renewable energy within its range. These biological opinions concluded that proposed solar plants were not likely to jeopardize the continued existence of the desert tortoise primarily because they were located outside of critical habitat and desert wildlife management areas that contain most of the land base required for the recovery of the species. The proposed actions also included numerous measures intended to protect desert tortoise during the construction of the projects, such as translocation of affected individuals. In aggregate, these projects would result in an overall loss of approximately 43,920 acres of habitat of the desert tortoise in California and Nevada (projects in the remaining Arizona and Utah portions of the range are negligible).We also predicted that the project areas supported up to 3,721 desert tortoises; we concluded that most of these individuals were small desert tortoises, that most large individuals would likely be translocated from project sites, and that most mortalities would be small desert tortoises that were not detected during clearance surveys. To date, 583 desert tortoises have been observed during construction of projects; most of these individuals were translocated from work areas, although some desert tortoises have been killed. The mitigation required by the Bureau and California Energy Commission, the agencies permitting these facilities, resulted in the acquisition of private land and funding for the implementation of various actions that are intended to promote the recovery of the desert tortoise. These mitigation measures are consistent with recommendations

in the recovery plans for the desert tortoise; many of the measures have been derived directly from the recovery plans and the Service supports their implementation. We expect that, based on the best available scientific information, these measures will result in conservation benefits to the desert tortoise; however, it is difficult to assess how desert tortoise populations will respond because of the long generation time of the species.

In August 2016, the Service (2016c) issued a biological opinion to the Bureau for the land use plan amendment under the Desert Renewable Energy Conservation Plan. The land use plan amendment addressed all aspects of the Bureau's management of the California Desert Conservation Area; however, the Service and Bureau agreed that only those aspects related to the construction, operation, maintenance, and decommissioning of renewable energy facilities were likely to adversely affect the desert tortoise. The land use plan amendment resulted in the designation of approximately 388,000 acres of development focus areas where the Bureau would apply a streamlined review process to applications for projects that generate renewable energy; the Bureau estimated that approximately 11,290 acres of modeled desert tortoise habitat within the development focus areas would eventually be developed for renewable energy. The Bureau also adopted numerous conservation and management actions as part of the land use plan amendment to further reduce the adverse effects of renewable energy development on the desert tortoise.

The land use plan amendment (Service 2016c) also increased the amount of land that the Bureau manages for conservation (e.g., areas of critical environmental concern, National Conservation Lands, etc.) from 6,118,135 to 8,689,669 acres; not all of the areas subject to increased protection are within desert tortoise habitat. The Bureau will also manage lands outside of development focus areas according to numerous conservation and management actions; these conservation and management actions are more protective of desert tortoises than direction contained in the previous land use plan. The Service (2016c) concluded that the land use plan amendment was not likely to jeopardize the continued existence of the desert tortoise and would benefit its recovery.

In addition to the biological opinions issued for solar development within the range of the desert tortoise, the Service (2012c) also issued a biological opinion to the Department of the Army for the use of additional training lands at Fort Irwin. As part of that proposed action, the Department of the Army removed approximately 650 desert tortoises from 18,197 acres of the southern area of Fort Irwin, which had been off-limits to training. The Department of the Army would also use an additional 48,629 acres that lie east of the former boundaries of Fort Irwin; much of this parcel is either too mountainous or too rocky and low in elevation to support numerous desert tortoises.

The incremental effect of the larger actions (i.e., solar development, the expansion of Fort Irwin) on the desert tortoise is unlikely to be positive, despite the numerous conservation measures that have been (or will be) implemented as part of the actions. The acquisition of private lands as mitigation for most of these actions increases the level of protection afforded these lands; however, these acquisitions do not create new habitat and Federal, State, and privately managed

lands remain subject to most of the threats and stresses we discussed previously in this section. Although land managers have been implementing measures to manage these threats and we expect, based on the best available scientific information, that such measures provide conservation benefits to the desert tortoise, we have been unable, to date, to determine whether the expected benefits of the measures have yet been realized, at least in part because of the low reproductive capacity of the desert tortoise. Therefore, the conversion of habitat into areas that are unsuitable for this species continues the trend of constricting the desert tortoise into a smaller portion of its range.

As the Service notes in the 5-year review (Service 2010b), "[t]he threats identified in the original listing rule continue to affect the [desert tortoise] today, with invasive species, wildfire, and renewable energy development coming to the forefront as important factors in habitat loss and conversion. The vast majority of threats to the desert tortoise or its habitat are associated with human land uses." Oftedal's work (2002 in Service 2010b) suggests that invasive weeds may adversely affect the physiological health of desert tortoises. Current information indicates that invasive species likely affect a large portion of the desert tortoise's range. Furthermore, high densities of weedy species increase the likelihood of wildfires; wildfires, in turn, destroy native species and further the spread of invasive weeds.

Drake et al. (2015) "compared movement patterns, home-range size, behavior, microhabitat use, reproduction, and survival for adult desert tortoises located in, and adjacent to, burned habitat" in Nevada. They noted that the fires killed many desert tortoises but found that in the first 5 years post-fire individuals moved deeper into burned habitat on a seasonal basis and foraged more frequently in burned areas (corresponding with greater production of annual plants and herbaceous perennials in these areas). Production of annual plants upon which desert tortoises feed was ten times greater in burned versus unburned areas but was dominated by non-native species (e.g., red brome [*Bromus rubens*]) that frequently have lower digestibility than native vegetation. During years six and seven, the movements of desert tortoises into burned areas contracted with a decline in the live cover of a perennial forage plant that rapidly colonizes burned areas. Drake et al. (2015) did not find any differences in health or survivorship for desert tortoises occupying either habitat (burned or unburned) during this study or in reproduction during the seventh year after the fire.

Climate change is likely to affect the prospects for the long-term conservation of the desert tortoise. For example, predictions for climate change within the range of the desert tortoise suggest more frequent and/or prolonged droughts with an increase of the annual mean temperature by 3.5 to 4.0 degrees Celsius (Christensen et al. 2007 in Service 2010b). The greatest increases will likely occur in summer, with a June-July-August mean increase of as much as five degrees Celsius. Precipitation is projected to decrease by five to 15 percent annually in the region, with winter precipitation potentially decreasing by up to 20 percent, and summer precipitation increasing by up to 5 percent (Christensen et al. 2007 in Service 2010b). Because germination of the desert tortoise's food plants is highly dependent on cool- season rains, the forage base could be reduced due to increasing temperatures and decreasing precipitation in winter. Although drought occurs routinely in the Mojave Desert, extended

periods of drought have the potential to affect desert tortoises and their habitats through physiological effects to individuals (i.e., stress) and limited forage availability. To place the consequences of long-term drought in perspective, Longshore et al. (2003) demonstrated that even short-term drought could result in elevated levels of mortality of desert tortoises. Therefore, long-term drought is likely to have even greater effects, particularly given that the current fragmented nature of desert tortoise habitat (e.g., urban and agricultural development, highways, freeways, military training areas, etc.) will make recolonization of extirpated areas difficult, if not impossible.

Core Criteria for the Jeopardy Determination

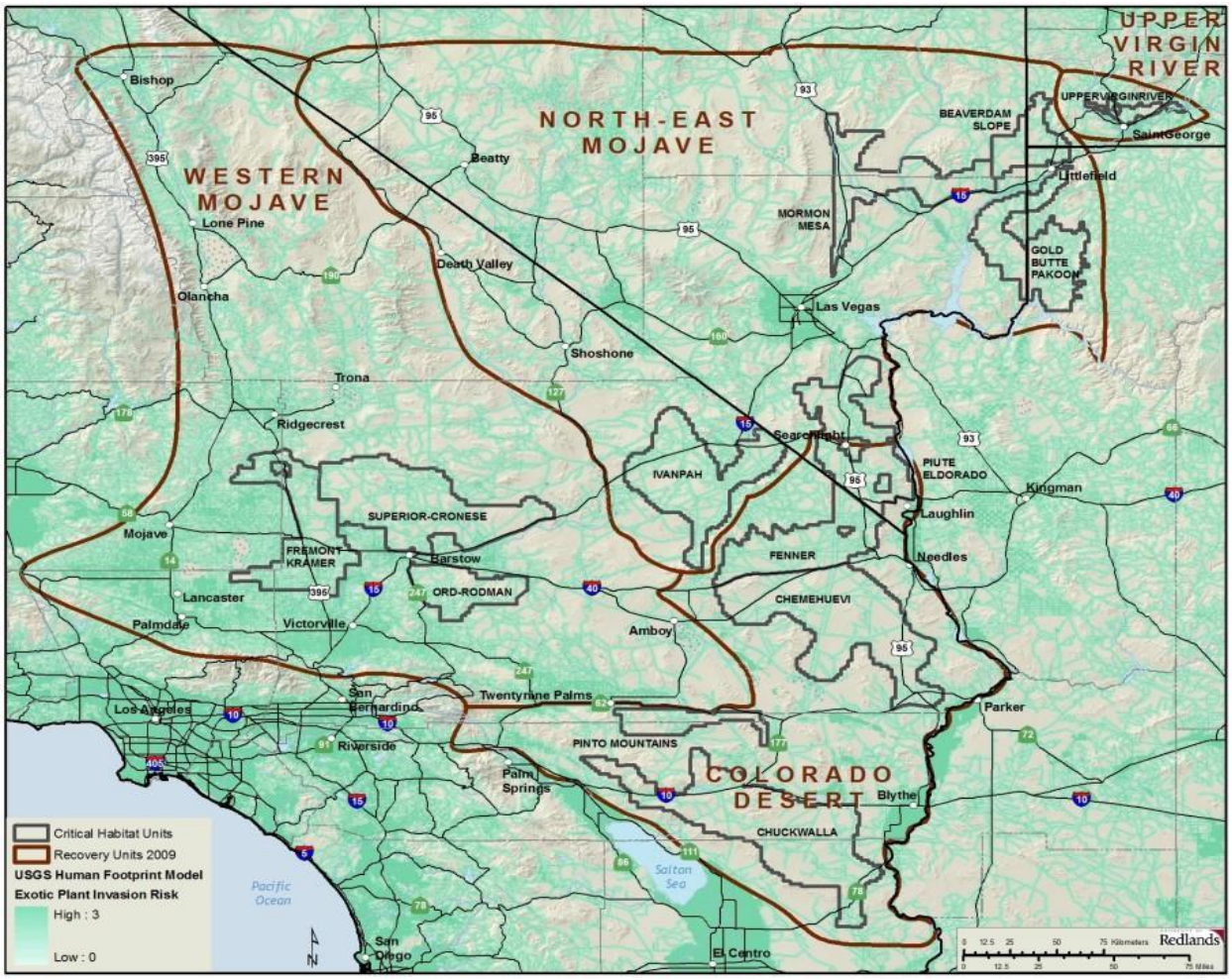
When determining whether a proposed action is likely to jeopardize the continued existence of a species, we are required to consider whether the action would "reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Although the Service does not explicitly address these metrics in the 5-year review, we have used the information in that document and more recent information to summarize the status of the desert tortoise with respect to its reproduction, numbers, and distribution.

Reproduction

In the 5-year review, the Service notes that desert tortoises increase their reproduction in high rainfall years; more rain provides desert tortoises with more high quality food (i.e., plants that are higher in water and protein), which, in turn, allows them to lay more eggs. Conversely, the physiological stress associated with foraging on food plants with insufficient water and nitrogen may leave desert tortoises vulnerable to disease (Oftedal 2002 in Service 2010b), and the reproductive rate of diseased desert tortoises is likely lower than that of healthy animals. Young desert tortoises also rely upon high-quality, low-fiber plants (e.g., native annual plants) with nutrient levels not found in the invasive weeds that have increased in abundance across its range (Oftedal et al. 2005; Tracy et al. 2004). Compromised nutrition of young desert tortoises likely represents an effective reduction in reproduction by reducing the number of animals that reaches adulthood. Consequently, although we do not have quantitative data that show a direct relationship, the abundance of weedy species within the range of the desert tortoise has the potential to affect the reproduction of desert tortoises and recruitment into the adult population in a negative manner.

Various human activities have introduced numerous species of non-native invasive plants into the California desert. Routes that humans use to travel through the desert (paved and unpaved roads, railroads, motorcycle trials, etc.) serve as pathways for new species to enter habitat of the desert tortoise and for species that currently occur there to spread. Other disturbances of the desert substrate also provide invasive species with entry points into the desert. The following map depicts the potential for these species to invade habitat of the desert tortoise. The reproductive capacity of the desert tortoise may be compromised to some degree by the

abundance and distribution of invasive weeds across its range; the continued increase in human access across the desert likely continues to facilitate the spread of weeds and further affect the reproductive capacity of the species.



Numbers

In the 5-year review, the Service discusses various means by which researchers have attempted to determine the abundance of desert tortoises and the strengths and weaknesses of those methods. Due to differences in area covered and especially to the non-representative nature of earlier sample sites, data gathered by the Service's current range-wide monitoring program cannot be reliably compared to information gathered through other means at this time.

Data from small-scale study plots (e.g., 1-square mile) established as early as 1976 and surveyed primarily through the mid-1990s indicate that localized population declines occurred at many sites across the desert tortoise's range, especially in the western Mojave Desert; spatial analyses of more widespread surveys also found evidence of relatively high mortality in some parts of the

range (Tracy et al. 2004). Although population densities from the local study plots cannot be extrapolated to provide an estimate of the number of desert tortoises on a range wide basis, historical densities in some parts of the desert exceeded 100 adults in a square mile (Tracy et al. 2004). The Service (2010b) concluded that "appreciable declines at the local level in many areas, which coupled with other survey results, suggest that declines may have occurred more broadly."

The range-wide monitoring that the Service initiated in 2001 is the first comprehensive attempt to determine the densities of desert tortoises in conservation areas across their range. The Desert Tortoise Recovery Office (Service 2015b) used annual density estimates obtained from this sampling effort to evaluate range-wide trends in the density of desert tortoises over time. (All references to the density of desert tortoises are averages. Some areas support higher densities and some lower; desert tortoises are not distributed in uniform densities across large areas.) This analysis indicates that densities in the Northeastern Mojave Recovery Unit have increased since 2004, with the increase apparently resulting from increased survival of adults and sub-adults moving into the adult size class. The analysis also indicates that the populations in the other four recovery units are declining; the following table depicts the estimated numbers of desert tortoises within conservation areas in each recovery unit and the rates of population change. Surveys did not include the steepest slopes in these desert tortoise conservation areas; however, the model developed by Nussear et al. (2009) generally rates steep slopes as less likely to support desert tortoises. Densities in the Joshua Tree and Piute Valley conservation areas within the Colorado Desert Recovery Unit seem to be increasing, although densities in the recovery unit as a whole continue to decline (see Table 3).

Table 3. Line distance sampling data from desert tortoise recovery units

Recovery Units	2014 Density (adults/km^2)	2004 Abundance	2014 Abundance	Change	Percentage of Change
Western Mojave	2.8	35,777	17,644	-18,133	-51
Colorado Desert	3.7	67,087	42,770	-24,317	-36
Northeastern Mojave	4.4	4,920	18,220	+13,300	+270
Eastern Mojave	1.5	16,165	5,292	-10,873	-67
Upper Virgin River	15.3	2,397	1,760	-637	-27
Total		126,346	85,686	-40,660	-32

In the previous summary of the results of range-wide sampling (Service 2012g), we extrapolated the densities obtained within conservation areas (e.g., desert wildlife management area, Desert Tortoise Research Natural Area, Joshua Tree National Park) to all modeled habitat of the desert tortoise. This extrapolation likely exaggerated the number of desert tortoises because we applied the values for areas where densities are generally highest (i.e., the conservation areas) to areas where desert tortoises exist in very low densities (e.g., the Antelope Valley). We are also aware of a few areas where the density of desert tortoises outside of conservation areas is higher than inside.

To further examine the status of desert tortoise populations over time, we compared the densities of desert tortoises in the Western Mojave Recovery Unit between 2004 and 2014 (see Service 2015b). In 2004, desert tortoise conservation areas surveyed in the Western Mojave Recovery

Unit supported an average density of approximately 5.7 adults per square kilometer (14.8 per square mile). In contrast, surveys in the same areas in 2014 indicated that densities had decreased to 2.8 adults per square kilometer (7.3 per square mile). This decline in densities is consistent with decreases in density of populations in all recovery units over the same time period, with the exception of the Northeastern Mojave Recovery Unit. In fact, historical survey data from numerous plots in the Western Mojave Recovery Unit during the late 1970s and early 1980s suggest that adult desert tortoise densities ranged from 50 to 150 per square mile (Tracy et al. 2004).

To further assess the status of the desert tortoise, the Desert Tortoise Recovery Office (Service 2015b) used multi-year trends from the best-fitting model describing $\log_e$-transformed density of adult animals per square kilometer. In 2014, 3 of the 5 recovery units supported densities below 3.9 adult animals per square kilometer (Western Mojave [2.8], Eastern [1.5], and Colorado Desert [3.7]; see table 10 in Service 2015b), which is the minimum density recommended to avoid extinction in the 1994 recovery plan. The Northeastern Mojave Recovery Unit supported 4.4 adult desert tortoises per square kilometer and the Upper Virgin River Recovery Unit, which is by far the smallest recovery unit, supported 15.3 adults per square kilometer.

The Service (2015b) evaluated changes in size distribution of desert tortoises since 2001. In the Western Mojave and Colorado Desert recovery units, the relative number of juveniles to adults indicates that juvenile numbers are declining faster than adults. In the Eastern Mojave, the number of juvenile desert tortoises is also declining, but not as rapidly as the number of adults. In the Upper Virgin River Recovery Unit, trends in juvenile numbers are similar to those of adults; in the Northeastern Mojave Recovery Unit, the number of juveniles is increasing, but not as rapidly as are adult numbers in that recovery unit. Juvenile numbers, like adult densities, are responding in a directional way, with increasing, stable, or decreasing trends, depending on the recovery unit where they are found.

In this context, we consider “juvenile” desert tortoises to be animals smaller than 180 millimeters in length. The Service does not include juveniles detected during range-wide sampling in density estimations because they are more difficult to detect and surveyors frequently do not observe them during sampling. However, this systematic range-wide sampling provides us with an opportunity to compare the proportion of juveniles to adults observed between years.

Distribution

Prior to 1994, desert tortoises were extirpated from large areas within their distributional limits by urban and agricultural development (e.g., the cities of Barstow and Lancaster, California; Las Vegas, Nevada; St. George, Utah; etc.; agricultural areas south of Edwards Air Force Base and east of Barstow), military training (e.g., Fort Irwin, Leach Lake Gunnery Range), and off-road vehicle use (e.g., portions of off-road management areas managed by the Bureau and unauthorized use in areas such as east of California City, California).

Since 1994, urban development around Las Vegas has likely been the largest contributor to habitat loss throughout the range. Desert tortoises have been essentially removed from the 18,197-acre southern expansion area at Fort Irwin (Service 2012c). The development of large solar facilities has also reduced the amount of habitat available to desert tortoises. No solar facilities have been developed within desert tortoise conservation areas, such as desert wildlife management areas, although such projects have occurred in areas that the Service considers important linkages between conservation areas (e.g., Silver State South Project in Nevada).

Table 4 depicts acreages of habitat (as modeled by Nussear et al. 2009, using only areas with a probability of occupancy by desert tortoises greater than 0.5 as potential habitat) within the recovery units of the desert tortoise and of impervious surfaces as of 2006 (Fry et al. 2011); calculations are by Darst (2014). Impervious surfaces include paved and developed areas and other disturbed areas that have zero probability of supporting desert tortoises. All units are in acres.

Table 4. Desert tortoise habitat occupancy model

Recovery Units	Modeled Habitat	Impervious Surfaces (percentage)	Remaining Modeled Habitat
Western Mojave	7,585,312	1,989,843 (26)	5,595,469
Colorado Desert	4,950,225	510,862 (10)	4,439,363
Northeastern Mojave	3,012,293	386,182 (13)	2,626,111
Eastern Mojave	4,763,123	825,274 (17)	3,937,849
Upper Virgin River	231,460	84,404 (36)	147,056
Total	20,542,413	3,796,565 (18)	16,745,848

The Service (2010b) concluded, in its 5-year review, that the distribution of the desert tortoise has not changed substantially since the publication of the original recovery plan in 1994 in terms of the overall extent of its range. Since 2010, we again conclude that the species' distribution has not changed substantially in terms of the overall extent of its range, although desert tortoises have been removed from several thousand acres because of solar development and military activities.

ENVIRONMENTAL BASELINE

Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, we consider the action area to include all areas that the Marine Corps may affect through management of the Shared Use Area (SUA), military training in the expansion areas, desert tortoise translocation, and other areas of indirect effects within the Ord-Rodman ACEC. Table 5 contains information on the size of the various areas relevant to this consultation.

The action area for the 2012 biological opinion also included those regions of California where the Marine Corps predicted OHV recreation displaced from the Johnson Valley OHV Management Area was likely to occur. As discussed in the Consultation History section, the NDAA closed portions of the Johnson Valley OHV Management Area to public use in 2014 and resulted in displacement of OHV recreation to other areas of the desert. The proposed action we are currently analyzing in this biological opinion will not result in additional effects from OHV displacement that we did not analyze in 2012. However, we have included areas of OHV displacement in the action area to provide for continuity with the previous biological opinion and to provide baseline information in analyzing aspects of the current action that overlap these areas.

In its biological assessment, the Marine Corps also included the "new and modified airspace, and adjacent surrounding lands in San Bernardino County, California that underlie the proposed airspace establishment" as part of its action area. We did not include this area in our biological opinion because the use of the airspace will not result in effects to desert tortoises (see Bowles et al. 1999).

Table 5. Size of affected areas within the action area[16]

Areas to be Affected by Military Activities	**Size of Area (square kilometers)**
Existing Installation	**~2,420.0**
Exclusive Military Use Areas	~2,420.0
Special Use Areas-Category 1	73.7
Western Expansion Area (WEA)	**593.6**
Exclusive Military Use Area	378.9
Shared Use Area (SUA)	214.6
Special Use Areas Category 1	61.8
Southern Expansion Area (SEA)	**86.2**
Exclusive Military Use Area	86.2
Special Use Areas Category 1	11.9
Areas to be Affected by Desert Tortoise Translocation	**Size of Area (square kilometers)**
Recipient Sites[17]	**366.0**
Lucerne-Ord (LO) Recipient Site	162.5
Rodman-Sunshine Peak North (RSPN) Recipient Site	103.4
Broadwell Recipient Site	52.4
Siberia Recipient Site	39.6
Cleghorn Constrained Recipient Site	8.1
Control Sites	**125.2**
Rodman-Sunshine Peak South	54.0
Daggett	22.0
Calico	16.7
Ludlow	11.0

[16] The areas under each bold-faced area may overlap; for example, the special use areas described for the existing installation are also included in the total area for the existing installation.
[17] Recipient sites include the release and dispersal areas.

Cleghorn Control	9.5
Bullion	12.0
Ord-Rodman ACEC	**1,156.1**

In the following sections, we discuss those aspects of the environmental baseline that are relevant to the analysis of effects associated with this consultation. We have organized each subsection in the Environmental Baseline using the following geographic regions of the action area: 1) areas to be affected by military activities (existing MCAGCC installation and expansion areas); 2) areas to be affected by desert tortoise translocation (proposed recipient sites and portions of the Ord-Rodman ACEC that overlap with proposed recipient sites); 3) the Ord-Rodman ACEC; and 4) areas that have been affected by OHV displacement following the MCAGCC expansion in 2014. In instances where we have not provided information for one of these geographic regions, we have done so because the information is either already adequately considered in the Status of the Species section or we have determined that we do not require the information to analyze the effects of the proposed action.

Existing Conditions in the Action Area

In this section, we discuss the anthropogenic effects and natural conditions within the action area (see Figure 8 for a map that contains the entire action area) as they relate to desert tortoises and their habitat. Unless we have noted otherwise by citing a biological opinion, the anthropogenic conditions present in the action area were present prior to the listing of the desert tortoise. The following discussion includes only the biological opinions for major actions that have likely had a long-term effect on the status of the desert tortoise and its critical habitat within the action area.

Smaller projects have also occurred within the action area. We have not provided a list or analysis of the biological opinions that addressed these actions because they did not measurably influence the overall status of the desert tortoise or its critical habitat in the action area. These additional biological opinions are available upon request from the Ventura Fish and Wildlife Office.

Existing Installation

The Department of Defense manages the existing installation and currently uses it for military training activities similar to those discussed in the proposed action for this biological opinion. Approximately 27.5 percent of the 2,428.1-square kilometer installation is unavailable for training due to rough terrain (Service 2002; 1-8-99-F-41) and approximately 242.8 square kilometers are within special use areas where training activities are limited. The remaining portions of the base are open to military training. Approximately 30 percent of MCAGCC has experienced at least 25 percent shrub loss due to mission-related activities. Areas that have experienced this degree of disturbance but which have been otherwise undisturbed for 40 to 50 years have experienced only partial recovery at best (Marine Corps 1999b in Service 2002; 1-8-99-F-41). Woodman et al. (2001) also noted that surveys could not locate desert tortoises on 6.6 percent of the base, probably partially due to a large amount of vehicle activity and limited

habitat in the northeastern portions of MCAGCC, where desert tortoise sign were not found. Another 18.9 percent of the base had substantially decreased desert tortoise abundance, probably partially due to vehicle activity (Woodman et al 2001, Henen 2012e). Figure 5-2 of the biological assessment (DoN 2011a) depicts the areas of heaviest vehicle use on the existing installation.

In 2002, we issued a biological opinion for base-wide operations (Service 2002; 1-8-99-F-41) that analyzed the effects of the current training activities. We concluded that military use has degraded, and will continue to degrade, habitat quality and likely cause further declines in the number of desert tortoises on MCAGCC. However, we determined that desert tortoises were likely to persist in low numbers on the installation and concluded that the ongoing military training on MCAGCC was not likely to jeopardize the continued existence of the desert tortoise because habitat and populations on MCAGCC were not critical to the long-term survival and recovery of the species. The 2002 biological opinion governed the Marine Corps training activities on the existing installation prior to issuance of the 2012 biological opinion that this biological opinion is replacing. In the 2002 biological opinion, we did not estimate the amount of take that would occur due to training activities. However, we noted that the Marine Corps estimate for mortality associated with its base-wide operations was approximately 10 per year.

Expansion Areas

The western expansion area occurs within the existing Johnson Valley OHV Management Area (DoN 2011a). The Bureau designated this area for intensive multiple uses under the California Desert Conservation Area (CDCA) Plan (Bureau 1980). Historically, the area was used for mining and livestock grazing (DoN 2011a), but the primary land use in recent decades has been OHV recreation with the highest concentrations of use in the central, southern, and southwestern portions of the proposed western expansion area (Stow 1988 in Bureau et al. 2005, DoN 2011a). Bureau et al. (2005) estimated that above-average OHV disturbance occurred over 531.0 square kilometers of the Johnson Valley OHV Management Area with an additional 235.7 square kilometers of unauthorized OHV disturbance occurring outside but in the immediate vicinity. DoN (2011a) estimated that areas of high disturbance (i.e., areas containing race routes used for large OHV events, designated OHV routes, and camping areas) and moderate disturbance (i.e., areas containing three to five routes and lower vehicle traffic; Karl 2010b, as noted in DoN 2011a) currently occur on 272.0 and 137.3 square kilometers of the western expansion area, respectively. The difference in the size of the area surveyed (i.e., entire OHV area versus western expansion area) likely accounts for the lower amount of disturbance identified by the Marine Corps. Given the rate at which desert habitats recover from disturbance, the apparent decrease in the amount of land disturbed between 2005 and 2011 is highly unlikely to be due to recovery of disturbed areas.

In the biological opinion for the Johnson Valley OHV Area Management Plan (Service 1991; 1-6-90-F-39), we concluded that OHV use in this area was not likely to jeopardize the continued existence of the species. We reached this conclusion because large portions of the area were already compromised by existing effects, the area was unlikely to contribute to long-term

survival and recovery of the species, and concentration of OHV activity in these areas was likely to reduce these activities in other areas to the northwest that were considered important to the species. In that biological opinion, we anticipated the loss of 551.7 square kilometers of desert tortoise habitat (already in various stages of deterioration) and the injury or mortality of 1,000 desert tortoises over the life of the management plan.

Health assessments performed on desert tortoises found in the expansion areas indicate that upper respiratory disease rates within the populations in the expansion areas are relatively low (see Table 6). There are no data to estimate canid predation rates within the areas.

Table 6. Disease and canid trauma percentages for desert tortoises in the action area

Recipient Site	**Incidence of Disease**[18]				**Canid Trauma**		
	M. agassizii		*M. testudineum*		Mild	Moderate	Severe
	Positive	Suspect	Positive	Suspect			
Western Expansion Area	1.7	7.3	0.8	2.0	NA	NA	NA
Southern Expansion Area	0	4.5	0	0	NA	NA	NA

Bureau-managed cattle and ephemeral sheep grazing allotments also overlap portions of the western expansion area, but sheep grazing has not occurred in this area since 1992 (DoN 2011a). Cattle grazing is currently active on the Ord Mountain allotment at low levels of approximately 25-30 head per year (Chavez 2012 and 2016). Most of this allotment lies within the Ord-Rodman ACEC. Stock rates on the allotment could increase after the grazing lease is renewed in 2017, and if the number of cattle increases it would be a very gradual process (Chavez 2016). However, current authorizations allow for up to 315 head per year to be grazed on this allotment and stocking rates could be raised at any time.

Transmission lines traverse the northern portion of the Johnson Valley OHV Management Area (DoN 2011a; Bureau 2008). Several existing mining operations (e.g., Bessemer Mine) currently occur on private lands within the western expansion area (Bureau 2008).

Little activity is occurring in the southern expansion area with the exception of minor prospecting and limited dispersed recreational use (Karl 2010a).

Ord-Rodman ACEC

The transfer of lands to the Marine Corps in 2014 has already resulted in displacement of OHV recreation that has affected the ACEC, and translocation of desert tortoises into some portions of the Ord-Rodman ACEC will occur prior to the start of military training (DoN 2011a). The Marine Corps has proposed specific areas where translocation recipient and control sites would occur within the ACEC, and we have described the existing condition of those areas in the next

[18] Disease data are presented as the percent of sampled animals that tested seropositive or suspect for *M. agassizii* or *M. testudineum* antibodies; an animal receives a positive result when blood titer for *M. agassizii* or *M. testudineum* is greater than 64 and a suspect result when blood titer equals 32.

section. We have also included new data pertaining to the status of the desert tortoise in the ACEC made available since our 2012 biological opinion was issued. The following information is relevant to the ACEC as a whole.

Two livestock allotments lie within the boundaries of the Ord-Rodman ACEC (i.e., Ord Mountain, Valley Well). Large portions of the Ord Mountain Allotment are located at or above 4,000 feet (1219.2 meters) in elevation (Bureau 2004). Luckenbach (1982) states that most desert tortoises reside at elevations between 1,000 and 3,000 feet (304.8 and 914.4 meters); during range-wide monitoring, we have regularly found desert tortoises up to 4,000 feet (1219.2 meters), although they are most common between 1,300 and 2,800 feet (396.2 and 853.4 meters) in elevation (Allison 2012). Two key grazing areas on the allotment are located below 4,000 feet (1219.2 meters) in elevation, but these areas have historically had grazing utilization levels that the Bureau would characterize as light to non-use (Service 2006c). Between 1990 and 2003, the number of head of cattle within the allotment ranged from 145 to 385. In 6 of those years, more than 300 head were present; less than 200 were present during 4 years (Service 2006c). Currently, only 25 head of cattle typically occur on the allotment (Chavez 2012a and 2016). The Valley Well Allotment covers 2.1 square kilometers and is grazed by a few horses (Service 2007, 1-8-07-F-37R).

Berry (1996) documented evidence of disease, poaching, and environmental contaminants at the Stoddard Valley permanent study plot in the northwestern portion of the ACEC. Common ravens and feral or free-ranging dogs have also killed desert tortoises at the Lucerne Valley permanent study plot in the southwestern portion of the ACEC.

Unless otherwise noted, the information in the following paragraphs is from LaPre (2005 in Service 2006c). The Ord-Rodman ACEC contains three active utility corridors: 1) Corridor G is 3.2 kilometers wide, lies along Interstate 40 at the northern boundary of the ACEC, and contains one 30-inch (0.8 meter) pipeline; 2) Corridor D is 3.2 kilometers wide, and contains two 287-kilovolt power lines and one 500-kilovolt power line; and 3) Corridor H is 3.2 kilometers wide and contains one 34-inch (0.9 meter) pipeline.

Several OHV routes occur within the Ord-Rodman ACEC, which is situated between the Johnson Valley and Stoddard Valley OHV Management Areas. The Western Mojave Off-Road Vehicle Designation Project, completed by the Bureau in June 2006, designated all routes as open, closed or limited in use within the ACEC (Service 2003). This planning effort is currently under review and is in the process of being modified with an expected Record of Decision by October 2019. The Bureau et al. (2005) documented above-average OHV use within portions of the Ord-Rodman ACEC. Unauthorized OHV activity occurs in the western portion of the ACEC along Highway 247, as well as in the northwestern and southwestern portions of the ACEC that lie adjacent to the Stoddard Valley and Johnson Valley. Most of this unauthorized use is associated with recreation that emanates from the Stoddard Valley and Johnson Valley OHV areas. During the 11 years prior to the designation of the Ord-Rodman ACEC in 1989, the number of unauthorized OHV routes in the West Mojave Plan Ord Mountain route network

increased by approximately 27 percent; since Ord-Rodman was designated as an ACEC the Bureau has had limited success in preventing illegal use within the ACEC (DoN 2011c).

The transfer of lands to the Marine Corps in 2014 reduced the size of the Johnson Valley OHV Management Area by approximately 53.4 percent, concentrating an estimated 70 percent of use into the smaller area which lies adjacent to the southern and southwestern portions of the ACEC (DoN 2011c). An estimated 30 percent of use was predicted to be displaced to other areas, including a large portion of this to the Stoddard Valley OHV Management Area adjacent to the northwestern portion of the ACEC. OHV use levels at the Stoddard Valley OHV Management Area were expected to increase by 22 percent (DoN 2011c). We do not have baseline information on the historical OHV use in these areas, so we cannot quantify how the concentration of OHV use into areas within and outside the ACEC has increased the magnitude of effects to desert tortoises. However, we do expect that concentration of OHV use into these areas has resulted in a moderate to high increase in use from existing levels, which has potentially resulted in a moderate to high increase in the effects on desert tortoises remaining in these areas. Anecdotal reports have indicated that OHV use levels have generally increased in and around ACECs in the Western Mojave Recovery Unit since the 2014 land transfer, in both authorized and unauthorized areas (BLM 2014).

In the biological opinion for the Bureau's West Mojave Plan, we evaluated the effects of route designation and livestock grazing throughout the western Mojave Desert (Service 2006c; 1-8-03-F-58). We concluded that the proposed revisions to the CDCA Plan were not likely to jeopardize the continued existence of the desert tortoise or result in adverse modification or destruction of its critical habitat. We reached these conclusions primarily because most of the actions proposed by the Bureau would result in fewer effects to desert tortoises and their critical habitat than had occurred under the previous CDCA Plan. In the 2012 biological opinion for the land acquisition and airspace establishment for MCAGCC, we concluded that OHV displacement and increased authorized and unauthorized OHV use within the Ord-Rodman ACEC were not likely to jeopardize the continued existence of the desert tortoise or result in adverse modification or destruction of its critical habitat. We reached these conclusions primarily because the most recent estimate for density in the ACEC at that time was 7.5 large desert tortoises per square kilometer, which is approximately twice the minimum viability threshold identified in the Service's 1994 recovery plan, and was believed to provide a buffer against the effects of OHV displacement.

Translocation Recipient Sites

Recipient sites for desert tortoise translocation were selected based on the Service's draft translocation guidance (2016b), with the following factors considered: 1) sites that currently have, or that are predicted within 3 years to have, a depleted desert tortoise population (less than 3.9 large desert tortoises per square kilometer); 2) the presence of sufficiently good habitat that is part of a connected system of occupied desert tortoise habitat; 3) sites that are protected or receive adequate protection; and 4) sites that are not subject to heightened physical threats or intensive historic, current, or future land uses. The following site descriptions and baseline

conditions are summarized from MCAGCC (2016b). Table 7 summarizes disease and canid trauma data that were collected as part of the threats assessment for each proposed recipient site.

Table 7. Disease and canid trauma percentages for desert tortoises in the recipient sites

Recipient Site	**Incidence of Disease**[19,20]				**Canid Trauma**[21]		
	M. agassizii		*M. testudineum*		Mild	Moderate	Severe
	Positive	Suspect	Positive	Suspect			
Lucerne Ord	3.0	1.0	6.0	16.0	18.6	22.6	15.7
Rodman-Sunshine Peak N (2015)	0	8.3	0	0	26.5	19.8	9.9
Rodman-Sunshine Peak N (2014)	0	6.3	0	6.3	2.4	5.9	5.9
Broadwell	12.0	8.0	0	12.0	22.2	22.2	3.7
Siberia	0	7.5	0	2.5	24.4	19.5	7.3
Cleghorn Constrained (2015)	0	0	0	0	31.6	26.3	42.1
Cleghorn Constrained (2013)	4.5	0	0	13.6	NA	NA	NA

Lucerne-Ord – MCAGCC (2016b) considers the habitat at the Lucerne-Ord recipient site to be fair to good quality desert tortoise habitat composed largely of refugia and future suitable habitat. It consists of a mixture of federal and private lands that lie in a large bowl with natural topographic barriers (the Ord Mountains) to the west and north. It overlaps the Ord-Rodman ACEC, which restricts future development. There are no highways or heavily used roads within the site. OHV use is moderate to high near low mountains and along existing roads. The northern third of the Lucerne-Ord site overlaps with the southern edge of the Ord Mountain grazing allotment. Although this site has a long history of cattle grazing only 25-30 cattle have grazed there in recent years (Chavez 2016).

Lucerne-Ord has a large transmission line corridor running through the site. The transmission line towers provide nesting potential for common ravens, with eight active nests and one offending nest (desert tortoise hatchling remains beneath nest) observed along the corridor in spring 2015 (MCAGCC 2016b). Point count surveys in late spring and summer 2015 suggest low common raven density; however, surveys conducted in fall 2015 documented higher numbers of common ravens flying through the area (MCAGCC 2016b).

Disease rates in this site are moderate, with slightly more than 25 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 7). Trauma to desert tortoises due to canids was moderate to high, with roughly 57 percent of sampled individuals showing signs of trauma and nearly 30 percent of live desert tortoises exhibiting moderate to severe trauma from canids (see Table 7). It was noted by the Marine Corps that much of this trauma was healed as opposed to recent, and that many nearby houses have been abandoned with the closest current residence being approximately 6.6 kilometers south of the release area. This may suggest a reduction in the number of dogs present throughout the site (MCAGCC 2016b).

[19] Unless otherwise noted, disease data were collected in fall 2014 and 2015.
[20] Disease data are presented as the percent of sampled animals that tested seropositive or suspect for *M. agassizii* or *M. testudineum* antibodies; an animal receives a positive result when blood titer for *M. agassizii* or *M. testudineum* is greater than 64 and a suspect result when blood titer equals 32.
[21] Canid trauma rankings follow trauma scoring found in Berry and Christopher (2001).

Overall mortality rates for large desert tortoises are estimated to be fewer than 0.7 individuals per square kilometer over the last 4 years, which is generally consistent with rates at most other recipient sites.

Rodman-Sunshine Peak North – MCAGCC (2016b) considered the Rodman-Sunshine Peak North recipient site to have fair to moderately good quality desert tortoise habitat composed largely of refugia and future suitable habitat. It consists of federally-managed land protected by a broad lava flow to the north and bounded by the Rodman Mountains Wilderness to the west. It overlaps multiple conservation areas (Ord-Rodman ACEC, lands incorporated into BLM's National Landscape Conservation System, and the Marine Corps' Sunshine Peak Training Area) that restrict future development. Other than a transmission corridor with three high-voltage transmission lines, and a distribution line, there is little existing disturbance within the site. The Sunshine Peak Training Area has restricted military access with on the ground activity limited to just a few days a year. There is relatively little recreation use of the site and it receives little disturbance.

The transmission line running through the Rodman-Sunshine Peak North site provides nesting for common ravens, with 11 nests and one offending nest (desert tortoise hatchling remains beneath nest) observed on transmission poles within 6.5 kilometers of the recipient area. Common ravens are generally believed to occupy the site in low numbers (MCAGCC 2016b).

Disease rates in this site are generally low, with fewer than 10 percent of sampled desert tortoises testing suspect and no desert tortoises testing positive for *Mycoplasma* infection during the 2 years of analysis (see Table 7). Trauma to desert tortoises due to canids was moderate to high with roughly 56 percent of sampled individuals showing signs of trauma in 2015, with nearly 30 percent of live desert tortoises exhibiting moderate to severe trauma from canids (see Table 7); 12 of 68 individuals had fresh trauma. Evidence of trauma was localized within the site, and is concentrated in areas to the west that are more proximate to a freeway rest area and nearby residences. Overall mortality rates for large desert tortoises are estimated to be approximately two individuals per square kilometer over the last four years, which is the highest of any of the recipient sites.

Broadwell - MCAGCC (2016b) considered the Broadwell recipient site to have moderate quality desert tortoise habitat. It consists of mostly federally-managed land bounded by low to tall mountains and is protected by the Cady Mountains Wilderness Study Area in a large portion of the site. It overlaps multiple conservation areas (Cady Mountains Wilderness Study Area, land incorporated in the BLM's National Landscape Conservation System, an ACEC, and the newly created Mojave Trails National Monument). There is relatively little recreation use of the site.

There is no current disturbance within the site, with the exception of a transmission line corridor with two high-voltage transmission lines. This line provides nesting potential for common ravens, although use within the site is unknown.

Disease rates in this site are the highest in any recipient site, with more than 30 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 7). This may indicate some level of current or historic disease within the site. Trauma to desert tortoises due to canids was moderate with roughly 48 percent of sampled individuals showing signs of trauma, with no fresh trauma observed during site surveys (see Table 7). Overall mortality rates for large desert tortoises are estimated to be fewer than 0.3 individuals per square kilometer over the last 4 years, which is the lowest of any recipient site.

Siberia - MCAGCC (2016b) considered the Siberia recipient site to have patchy desert tortoise habitat composed of 44 percent refugia or future suitable habitat, consisting of a mixture of federal, state, and private lands bounded by low mountains to the north and the MCAGCC installation to the south. It is located within the Mojave Trails National Monument, within an ACEC, and overlaps with lands incorporated in BLM's National Landscape Conservation System. A large block of private land in the western portion of the site leaves open the possibility for future use. There is no OHV recreation use of the site, although a pipeline right-of-way runs west-east through the site and provides potential access.

Heavy monsoon rains in the summer of 2014 scoured the large wash system in the center of the recipient site and removed large amounts of soil. In 2012, prior to the flood event, 24 desert tortoises were found in this wash (MCAGCC 2016b); during 2015 searches, only a single individual was located.

Disease rates in this site are low, with roughly 10 percent of sampled desert tortoises testing suspect and no desert tortoises testing positive for *Mycoplasma* infection (see Table 7). Trauma to desert tortoises due to canids was moderate with roughly 51 percent of sampled individuals showing signs of trauma, with no fresh trauma observed during site surveys (see Table 7). Overall mortality rates for large desert tortoises are estimated to be fewer than 0.7 individuals per square kilometer over the last 4 years, which may partially reflect the effects of the flood.

Cleghorn Constrained Recipient Site - MCAGCC (2016b) considered the Cleghorn Constrained Recipient Site to have suitable desert tortoise habitat. It consists of land in the Cleghorn Lakes Range Training Area, which is a special use area entirely within the MCAGCC installation and adjacent to the Cleghorn Lakes Wilderness. This site will be completely fenced with desert tortoise exclusion fence and will be studied as a constrained dispersal site. Its status as a special use area with the MCAGCC installation will protect it from public access.

Disease rates in this site are moderate, with roughly 18 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection in 2013, and no desert tortoises testing positive or suspect in 2015 (see Table 7). Trauma to desert tortoises due to canids was the highest of any recipient site, with over 68 percent of individuals showing signs of moderate to severe trauma (see Table 7). While none of this trauma appeared to be recent, the high rate of trauma is suspected to be linked to the presence of coyotes and feral dogs from residential areas within six to 6.5 kilometers of the site. Overall mortality rates for large desert tortoises are estimated to be approximately 0.5 individuals per square kilometer over the last 4 years.

In addition to these recipient sites the Marine Corps has identified two alternative areas that could be considered as recipient sites if the need arises. These sites were included in the 2011 General Translocation Plan (MCAGCC 2011) as potential recipient areas, and consist of 77.7 square kilometers adjacent to the Rodman Mountains Wilderness Area in the Ord-Rodman ACEC. In the event the Marine Corps uses these recipient sites it will first conduct Service protocol-level (Service 2009) presence/absence surveys to characterize the resident desert tortoise population, collect and analyze disease data prior to translocation of desert tortoises, and follow all other Service translocation guidance. Finally, it should be noted that during the first quarter of the 2017 water year the Barstow, California precipitation station recorded precipitation levels up to 125 percent above the average (NOAA 2017). Although precipitation patterns are typically variable and localized across the Mojave Desert, the translocation recipient sites are largely to the south and southeast of Barstow, and anecdotal reports from the Marine Corps indicate that the sites received a correspondingly higher than normal amount of precipitation.

Translocation Control Sites

Control sites for the desert tortoise translocation were selected based on similarity with the genetics, habitat, and local weather patterns of the recipient sites. The following site descriptions and baseline conditions are summarized from MCAGCC (2016b). Table 8 summarizes disease and canid trauma data that were collected as part of the threats assessment for each proposed recipient site.

Table 8. Disease and canid trauma rates for desert tortoises in the control sites

Control Site	**Incidence of Disease**[22]				**Canid Trauma**[23]		
	M. agassizii		*M. testudineum*		Mild	Moderate	Severe
	Positive	Suspect	Positive	Suspect			
Rodman-Sunshine Peak S	4.6	40.1	0.0	0.0	NA	NA	NA
Daggett	13.2	9.4	5.7	0.0	33.0	24.0	16.0
Calico	7.7	3.9	0.0	3.9	29.6	18.5	3.7
Ludlow	24.3	0.0	0.0	5.4	29.7	8.1	5.4
Cleghorn Control	5.9	11.8	0.0	0.0	44.4	16.7	27.8
Bullion	0.0	0.0	0.0	0.0	34.8	17.4	8.7

Rodman-Sunshine Peak South - MCAGCC (2016b) considered the Rodman-Sunshine Peak South control site to have moderately good to good quality desert tortoise habitat. It consists of federal land located in a special use area within the western expansion area, bordered by the Rodman Mountain Wilderness. It substantially overlaps conservation areas (Ord-Rodman ACEC, lands protected under the Bureau's National Landscape Conservation System, and the Sunshine Peak Training Area), which restrict future development. The site overlaps the Ord Mountain grazing allotment, which has experienced light use with only 25 to 30 cattle grazing

[22] Disease data are presented as the percent of sampled animals that tested seropositive or suspect for *M. agassizii* or *M. testudineum* antibodies; an animal receives a positive result when blood titer for *M. agassizii* or *M. testudineum* is greater than 64 and a suspect result when blood titer equals 32.
[23] Canid trauma rankings follow trauma scoring found in Berry and Christopher (2001).

there in recent years (Chavez 2016). There is a small area to the north of the site that is still part of the Johnson Valley OHV Management Area, and a proposed open OHV area to the west of the site. Thus, future OHV effects within the site are uncertain.

The Rodman-Sunshine Peak South site has a large transmission corridor running through it, which provides nesting potential for common ravens, although during 2015 surveys only one nest was observed within 6.5 kilometers of the site.

Disease rates in this site are high, with roughly 46.7 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 8). Canid predation rates on desert tortoises in the site are unknown. Overall mortality rates are also unknown.

Daggett - MCAGCC (2016b) considered the Daggett control site to have high quality desert tortoise habitat. It consists of a mixture of federal and private land approximately 1.3 kilometers from Interstate 40. It is located in the Ord-Rodman ACEC, and within lands that are part of the Bureau's National Landscape Conservation System. There is no predicted future use of the site.

The Daggett site has a large transmission corridor running through it, which provides nesting potential for common ravens. Nine active nests were observed within 6.5 kilometers of the site during surveys in 2015. Proximity to agriculture, residential development, and Interstate 40 likely result in a higher level of common raven subsidies and common raven presence on the site.

Disease rates in this site are moderate, with roughly 28 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 8). Trauma to desert tortoises due to canids is high, with approximately 73 percent of individuals showing signs of trauma (see Table 8). Coyotes are suspected to be the source of the majority of this predation. Overall mortality rates for large desert tortoises are also high for the site and are estimated to be approximately 1.8 individuals per square kilometer over the last 4 years.

Calico - The Calico control site consists of mostly federal land that overlaps with multiple conservation areas (lands protected under the Bureau's National Landscape Conservation System, the Cady Mountains Wilderness Study Area, an ACEC, and the newly created Mojave Trails National Monument) and is moderately protected against future development. It contains relatively undisturbed desert tortoise habitat, with a grazing allotment that has been retired. There is relatively little OHV activity within the site.

The Calico site has a large transmission corridor running through it, which provides nesting potential for common ravens. The Marine Corps does not have information about common raven presence or nesting within the site.

Disease rates in this site are moderate, with roughly 16 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 8). Trauma to desert tortoises due to canids is moderate, with approximately 52 percent of individuals showing signs of trauma and a

generally low incidence of severe trauma (see Table 8). Overall mortality rates for large desert tortoises are unknown.

Ludlow - The Ludlow control site has moderately good quality desert tortoise habitat and consists of a mixture of federal and state land. It is located near the MCAGCC installation and overlaps with multiple conservation areas (lands protected under the Bureau's National Landscape Conservation System, an ACEC, and the newly created Mojave Trails National Monument), which provide it protection from future development. There is negligible OHV recreation use in the site, although the presence of a pipeline right-of-way does provide potential access.

Disease rates in this site are relatively high, with roughly 30 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 8). Trauma to desert tortoises due to canids was the lowest of any control site, with approximately 43 percent of individuals showing signs of trauma and a generally low incidence of severe trauma (see Table 8). Overall mortality rates for large desert tortoises are estimated to be approximately 0.7 individuals per square kilometer over the last 4 years.

Cleghorn Control - The Cleghorn control site has good quality desert tortoise habitat and consists of land in the Cleghorn Lakes Range Training Area, which is a special use area entirely on the MCAGCC installation. It is adjacent to the Cleghorn Lakes Wilderness. Mortality and trauma to desert tortoises due to canid predation is high in the site, and is suspected to be linked to both coyotes and the presence of domestic dogs from residential areas approximately 5.5 kilometers to the southeast.

Disease rates in this site are moderate, with roughly 18 percent of sampled desert tortoises testing positive or suspect for *Mycoplasma* infection (see Table 8). Trauma to desert tortoises due to canids was the highest of any control site, with approximately 89 percent of individuals showing signs of trauma and almost 30 percent of individuals showing severe trauma (see Table 8). Overall mortality rates for large desert tortoises are estimated to be approximately 0.5 individuals per square kilometer over the last 4 years.

Bullion - The Bullion control site has good quality desert tortoise habitat and is well protected from public use and development due to its location in the Cleghorn Wilderness. There is the potential for military training activities to occur in the future within the site. Common raven presence and canid predation rates for the site are unknown.

No desert tortoises that were sampled tested positive or suspect for *Mycoplasma* infection (see Table 8). Trauma rates to desert tortoises due to canids were high; over 60 percent of individuals showed signs of trauma (see Table 8). Overall mortality rates for large desert tortoises are under analysis and should be available prior to the translocation.

Areas Likely Affected by OHV Displacement

As stated previously, we included an analysis of the effects of OHV displacement in our 2012 biological opinion that was expected to occur following the transfer of lands from the Johnson Valley OHV Management Area to the Marine Corps. Because the NDAA of 2014 formally transferred these lands to the Marine Corps in December of 2014, we have included a summary of the effects anticipated in the 2012 biological opinion as part of the current environmental baseline. Table 9 contains the sizes of the various areas likely affected by displacement from the Johnson Valley OHV management Area. OHV recreation occurred in all of these areas (both authorized and unauthorized locations) prior to passage of the NDAA in 2014.

Table 9. Size of affected OHV areas within the action area

Areas to be Affected by OHV Displacement	**Size of Area (square kilometers)**
Bureau of Land Management OHV Management Areas[24]	**1,718.3**
Stoddard Valley	371.2
Remaining Portions of Johnson Valley and SUA	570.8
El Mirage	121.7
Rasor	147.1
Spangler	406.6
Jawbone Canyon/Dove Springs	100.9
Limited Use OHV Areas[25]	**828.8**
California City/Rand Mountains	435.1
Edward Bowl (south of Edwards Air Force Base)	80.3
East Sierra (north of Dove Springs OHV Management Area)	36.3
Coyote Corner (areas south of Fort Irwin)	101.0
Silver Lakes (areas north of Helendale, south of Highway 58, east of Highway 395)	95.8
Hinkley (areas north and northwest of Barstow)	80.3

In our 2012 biological opinion, we anticipated that establishment of the EMUA would concentrate OHV use into the reduced Johnson Valley OHV Management Area and also result in displacement of recreational use to adjacent areas, including some locations within the Ord-Rodman ACEC. We also anticipated that displacement would increase the level of OHV recreation at the Stoddard Valley OHV Management Area by 22 percent, with some of that increased use likely affecting adjacent areas of BLM land within the Ord-Rodman ACEC. Although we do not have current information to substantiate our 2012 analysis, anecdotal information (Bureau 2014) indicates that OHV displacement and resulting increases in OHV use since the 2014 expansion have likely increased the magnitude of adverse effects in both authorized and unauthorized areas associated with the Johnson and Stoddard Valley OHV Areas.

[24] Values include size of OHV management area and areas of above-average unauthorized OHV recreation in adjacent areas (Bureau et al. 2005; Table 3-26).

[25] Based on *High OHV Use Areas* and *Residential Vehicle Impact Areas* in Table 3-26 and Map 3-14 from (Bureau et al. 2005).

Our 2012 biological opinion also estimated that the use in the Rasor, Spangler Hills, Jawbone Canyon/Dove Springs, El Mirage OHV Areas, and several other OHV use areas would increase to varying degrees. Based on low levels of anticipated increase or the lack of substantial desert tortoise populations in these areas, we concluded that increases in OHV use in these areas would not lead to an appreciable change in the existing effects associated with OHV recreation on desert tortoises.

The Service and Bureau have previously consulted on recreational use of the El Mirage, Johnson Valley, Spangler Hills, and Stoddard Valley OHV Management Areas (Service 1990 [El Mirage]; 1991 [Johnson Valley]; 1992 [Spangler]; 1993b [Stoddard Valley]). In these biological opinions, the Service anticipated that OHV use would reduce the density of desert tortoises in these areas or even extirpate them, but we concluded that the management of the OHV areas was not likely to jeopardize the continued existence of the desert tortoise because all of the areas were degraded prior to the listing of the desert tortoise and were not necessary for its recovery. In total, we anticipated that approximately 3,018 desert tortoises would be killed or injured and 848.6 square kilometers of habitat would be degraded. Our 2012 biological opinion analyzed the displacement of OHVs from the Johnson Valley OHV Management area to these other OHV areas. Although we concluded that the OHV displacement would accelerate the rate of decline of desert tortoises in these areas, we concluded that it would not jeopardize the continued existence of the species.

In our 2012 biological opinion, we also analyzed additional vehicle use of the Bureau's open route network that may result from the displacement of users from Johnson Valley has the potential to increase the amount of mortality of desert tortoises. However, the Bureau and Service (in Service 1990; 1991; 1992; 1993b) recognized during the consultation on the Bureau's open route network that the agencies could not predict the amount of future use at the time of the consultations. The incidental take statements from those biological opinions remain in effect and unchanged; if the amount of incidental take discussed in those biological opinions is exceeded, the Bureau will need to re-initiate formal consultation. The re-initiation would allow the Bureau and Service to assess the status of route use and develop additional means of reducing mortality.

Outside of the OHV management areas, cross-country travel for recreation is unauthorized; vehicles may leave open routes to stop, park, and camp. The restrictions for stopping, parking, and camping differ within and outside of the ACECs; we analyzed the effects of these uses in our biological opinion for the amendment of the CDCA Plan for the western Mojave Desert (Service 2006c; 1-8-03-F-58).

Livestock grazing has occurred in all areas that will receive OHV displacement, with the exception of the Rasor OHV Management Area. Within recent years, livestock grazing has been removed from all of the allotments within ACECs, except for the Ord Mountain and Valley Well allotments within the Ord-Rodman ACEC. Sheep and cattle allotments are still open within the remaining areas.

Utility corridors containing above ground transmission lines, natural gas pipelines, and/or telecommunication lines also cross several of these areas. These linear facilities have resulted in loss of habitat, mortality of desert tortoises during construction, and serve as an ongoing subsidy for common ravens by providing roosting and hunting perches.

Status of the Desert Tortoise in the Action Area

The following discussion of the status of the desert tortoise in the action area first considers population numbers and trends across the three primary portions of the action area: the existing installation, expansion areas (WEA and SEA), and the Ord-Rodman ACEC. We have followed this broader discussion with information specific to portions of the action area that translocation will directly affect (MEB objective, WEA and SEA high- and moderate-intensity disturbance areas, and the translocation recipient and control sites). With a few exceptions, the areas affected directly by translocation are geographic subareas of the existing installation, expansion areas, or the Ord-Rodman ACEC. Therefore, the information in our preliminary discussion helps to provide context for the areas affected by translocation activities. We note that much of the data upon which we build these estimates is not recent (i.e., collected within the last 5 years). Given the declines that have been more recently documented in the broader Western Mojave Recovery Unit we anticipate that the following estimates are overestimates, but we are unable to accurately correlate broader regional trends with the estimates from the MCAGCC installation.

In addition, training on the existing installation, covered under the 2002 biological opinion, overlaps all of the areas where the Marine Corps is proposing to train under the current proposed action. Below, we have estimated the current number of desert tortoises that occupy the existing installation based on the best available science. However, this information is from the late 1990s, and training under the 2002 biological opinion has likely reduced the number of desert tortoises on the existing installation since the time the data that our population estimates are based on was collected.

Existing Installation and Expansion Areas

The Marine Corps conducted surveys in the western and southern expansion areas in October 2009 using the TRED method (Karl 2002) and pre-project survey protocols (Service 2010a). Woodman et al. (2001) conducted strip transect surveys on the existing installation in 1997 and 1999. In addition, the Service conducts annual line distance sampling surveys of the Ord-Rodman ACEC to estimate the abundance of large desert[26] tortoises (Buckland et al. 2001 in Service 2010c).

Table 10 summarizes these initial pre-project estimates for desert tortoise population size for large desert tortoises in the existing installation and the expansion areas. These data were collected using both the TRED and Service protocols for the western and southern expansion

[26] See footnote 9, *supra*.

areas. The point estimates for both methods are comparable, but the confidence interval using the Service's protocol is wider.

Table 10. Estimates of the number of large desert tortoises in the MCAGCC installation

Area	Large Desert Tortoises (Point Estimate and 95 Percent Confidence Intervals [CI])					
	TRED Surveys (DoN 2011a)		Service Protocol (DoN 2011a)		Strip Transects (Woodman et al. 2001)	
	Point Estimate	CI	Point Estimate	CI	Point Estimate	CI
Existing Installation	-	-	-	-	9,593	1,482-13,908
Western Expansion Area	2,046	1,563-2,528	2,860	1,442-5,670	-	-
Southern Expansion Area	369	305-433	356	134-941	-	-

Because of the difficulty in locating small desert tortoises (i.e., animals with midline carapace length less than 160 millimeters), the estimates from these survey methods do not incorporate these smaller size classes. A methodology for estimating population size for smaller size classes through direct survey does not currently exist, so the Marine Corps employed indirect methods that use adult population estimates and a life history table that the Bureau employed in the revised biological assessment for the Ivanpah Solar Electric Generating System (Bureau 2011). This method incorporates numerous assumptions detailed in Appendix C of the biological assessment (DoN 2011a). We have also used indirect methods for estimation of population size for smaller size classes in previous biological opinions (Service 2011d). These methods incorporate information from Turner et al. (1987), which estimated the size-class distribution of desert tortoises on the Goffs permanent study plot in the early 1980s. The life history table provided in Turner et al. (1987) indicated that individuals smaller than 180 millimeters comprised approximately 87 percent of the total population. We do not provide estimates in this biological opinion for the number of eggs that would be affected by the proposed action. We have used the number of large individuals as surrogates for the estimation of the number of small individuals, and we note that the Turner et al. estimation method assumes that the estimate for small desert tortoises assumes an egg hatching success rate of 55 percent.

Table 11 provides the estimates for smaller individuals from the biological assessment (DoN 2011a) and by using Turner et al. (1987) and the adult population estimates discussed above. For example, in the western expansion area, we provided a point estimate of 2,860 large desert tortoises. Given the proportion of the total population composed of smaller desert tortoises per Turner et al. (1987) (i.e., 87 percent), we assume that the large desert tortoises in the population comprise 13 percent of the population. Consequently, if 2,860 large desert tortoises comprise 13 percent of the total population in the western expansion areas, then the total population there is 22,000 individuals and the number of small individuals (i.e., 87 percent of the total population) is 19,140. As stated previously, we estimated the number of large desert tortoises based on a threshold size of 160 rather than 180 millimeters. Therefore, this method tends to overestimate

the total population because it accounts for the individuals in size classes between 160 and 180 millimeters in the estimates for both the large and small individuals.

Table 11. Estimated number of small desert tortoises; the ranges are based on the 95 percent confidence limits for large desert tortoises

Area	Desert Tortoises in Smaller Size Classes			
	USMC Estimates using Bureau Life Table (DoN 2011a)		Service Estimates using Turner et al. (1987)	
	Point Estimate	Range	Point Estimate	Range
Existing Installation	45,281	-	64,199	9,918 - 93,077
Western Expansion Area	19,123	9,639 - 37,935	19,140	9,650 - 37,945
Southern Expansion Area	2,970	1,120 - 4,909	2,382	897 - 6,297

For this biological opinion, we will use the estimates derived from the Turner et al. (1987) information because the life history table used in the Bureau's biological assessment is hypothetical and not based on demographic survey information. We emphasize that, although we used the best available information, these numbers are only an estimate; the overall number of individuals may be different. For portions of the action area where direct survey occurred (i.e., existing installation and expansion areas), the survey data used for these estimates represent a single point in time and the number of individuals in these areas may change by the onset of the action. For example, desert tortoises may leave or enter the surveyed area, hatch, die, or been missed during the initial surveys.

In addition, population estimates for smaller size classes are based on a life-table distribution that has limited predictive ability because it assumes invariant schedules of reproduction and death, and constant annual rates of increase or decrease in size. Use of this information for our estimates also assumes that current egg production and survival rates in our action area are similar to that on the Goffs study site in the early 1980s. However, differences in resource availability, threats, climate and weather phenomena, and a variety of other variables can result in differences in the overall mortality rate of individuals at different sites and times and thereby create differences in the proportion of the population composed of individuals in these smaller classes. The desert tortoise population on the Goffs study site may have been more robust in the early 1980s than that currently within our action area because of declines that have occurred since the time of that study. The Goffs study also relied on a survey that does not account for the dynamic changes in the number of juveniles that are present over the course of a year. Therefore, depending on the time of year, the number of desert tortoises could vary considerably. For example, many more desert tortoises will be present immediately following the hatching of multiple egg clutches in late summer or early fall than in the early spring when many juveniles from the previous reproductive season's cohort would likely have died. Consequently, use of the Goffs data likely overestimates the actual number of small desert tortoises. The magnitude of this overestimate is unknown.

We also derived all of the estimates for smaller size classes from adult population estimates that used different survey methods. Some of these methods are meant to estimate population size for a specific size range of larger desert tortoises (i.e., equal to or larger than 160 millimeters for the Service's pre-project survey protocol; equal to or larger than 180 millimeters for line distance sampling). Other methods, such as strip transects (e.g., Woodman et al. 2001), derive an estimate based on detection of sign that correlates to the abundance of adult desert tortoises. Because these estimates for larger animals are the basis for the calculation of smaller size classes, their inherent flaws also serve as sources of error in the population estimate for smaller size classes.

The Marine Corps maintains three study plots on three training areas (Henen 2012). One plot, established in the mid-1980s, is located in the Sand Hill Training Area in the southwestern portion of MCAGCC. The remaining two plots, established in the early 1990s, were in the southwestern portion of the Emerson Lake Training Area (western portion of MCAGCC), and the southern portion of the Bullion Training Area (southeastern portion of MCAGCC). The Marine Corps relocated the Lava Training Area plot to the southern portion of the Bullion Training Area (southeastern portion of MCAGCC). These plots are part of designated special use areas. Permanent study plots also occur in the western portion of the western expansion area, the southwestern portion of the Ord-Rodman ACEC, and the northwestern portion of the Ord-Rodman ACEC.

In addition to these permanent study plots, survey efforts from the late 1970s, early 1980s, late 1990s, and 2001 provide information on density and relative abundance of desert tortoises and their sign (Berry and Nicholson 1984, Bureau et al. 2005). Surveys from the late 1990s and 2001 also identify die-off areas. These data provide information on the relative condition of desert tortoise populations in different areas and at different times within this portion of the action area.

The current distribution of desert tortoises across MCAGCC consists of large areas of low density with scattered higher-density population centers. Woodman et al. (2001) found that 70 percent of the existing installation had desert tortoise densities of less than 8.1 per square kilometer in the late 1990s; higher density patches 19.7 to 38.6 large desert tortoises per square kilometer occurred in the Sand Hill, south-central West, southern Bullion, southwestern Emerson Lake, Sunshine Peak, Quackenbush, Gays Pass, and Prospect Training Areas. Based on work at the permanent study plots in 1997 and 1999 within the Emerson and Sand Hill Training Areas, Woodman et al. (2001) concluded that the number of desert tortoises seemed to be stable. Henen (2010 in DoN 2011a) notes, however, that "long-term studies on these plots indicate declines of 50 to 70 percent since the 1980s." The Marine Corps is resurveying other portions of MCAGCC. The high- and moderate -intensity disturbance areas (in the western and southern expansion areas) that have already been surveyed for the proposed translocation of desert tortoises have yielded an average density of approximately 4.5 large desert tortoises per square kilometer in these areas.

Approximately 90 percent of the western expansion area has desert tortoise densities of less than 6.2 per square kilometer, with higher-density patches ranging from 7.0 to 12.0 large desert tortoises per square kilometer in the northern and eastern portions (DoN 2011a). The higher

density patches in the northern portion of the western expansion area (i.e., south, west, and north of Iron Ridge) overlap areas previously estimated to contain 7.7 to 38.6 desert tortoise per square kilometer in the late 1970s (Berry and Nicholson 1984). This population center is immediately east of areas noted as having densities of between 19.3 and 96.5 adults per square kilometer in the late 1970s (Berry and Nicholson 1984). However, this adjacent higher density patch, which extended from just south of Nellie Bly Mountain, south to the vicinity of the Rock Pile OHV staging area seems to have declined substantially since the late 1970s. Surveys of the Johnson Valley permanent study plot, located in this area, have shown declines of 77 percent since the early-1980s (Bureau et al. 2005). Current densities in this area are between 2.3 and 6.2 large desert tortoises per square kilometer (DoN 2011a). The northern portion of the western expansion area supports a region of higher densities of desert tortoises that is contiguous with an area of the Ord-Rodman ACEC in which workers consistently located desert tortoises during range-wide monitoring over the last 12 years (Bureau et al. 2005; Service 2006b, 2009b, 2010c, 2010d). We discuss trends in the number and distribution of desert tortoises in the Ord-Rodman ACEC later in this section.

Higher density patches (7.7 to 19.3 large desert tortoises per square kilometer) in the eastern portion of the western expansion area are in locations historically mapped as having between 0.4 and 7.7 adults per square kilometer in Berry and Nicholson (1984). However, these areas are in close proximity to Emerson Lake, which contained densities of 7.7 to 19.3 adults per square kilometer in the late 1970s (Berry and Nicholson 1984). These higher density patches are also in areas identified as having above-average desert tortoise sign during surveys in the late 1990s (Bureau et al. 2005).

In addition to these locations, another location of apparent population change is between Soggy and Melville Lakes in the shared use area, which contained densities of 19.3 to 38.6 adults per square kilometer in the late 1970s (Berry and Nicholson 1984) (Bureau et al. 2005). More recent density estimates are between 1.2 and 6.2 large desert tortoises per square kilometer (DoN 2011a). Throughout the remainder of the western expansion area, current densities of 2.3 to 6.2 large desert tortoises per square kilometer do not seem to be substantially different from the densities of 0.4 to 7.7 adults per square kilometer that the Bureau (et al 2005) estimated for the majority of the OHV area in the late 1970s.

No permanent study plots were located within or near the southern expansion area; consequently, we do not have any information on population trends in this area. Approximately 70 percent of the southern expansion area has desert tortoise densities of less than 6.2 large desert tortoises per square kilometer, with higher-density patches ranging from 7.0 to 14.7 large desert tortoises per square kilometer in the southwestern and northern portions of the southern expansion area.

For the existing installation, survey data provided by the Marine Corps for the 2002 consultation (Service 2002) estimated the desert tortoise population size in the installation at that time to be approximately 7,078 large individuals, with generally low densities throughout the installation. While the Service did not estimate the number of desert tortoises that would be injured or killed as a result of the 2002 proposed action, the Marine Corps predicted that at least ten desert

tortoises would be killed each year as a result of military training and associated activities. We are unable to accurately estimate the amount of mortality that has occurred since the 2002 biological opinion was issued; however we expect that mortality has occurred and that the current population size in the MCAGCC has been reduced as a result of military training.

Ord-Rodman ACEC

Although desert tortoises have historically been widely distributed throughout the Ord-Rodman ACEC (Tracy et al. 2004), extensive areas in the central portion of the ACEC exhibit low habitat potential (i.e., less likely to support desert tortoises; Nussear et al. 2009). Extensive survey work from the late 1990s to the present has documented four areas that consistently yield desert tortoise observations during the Service's range-wide monitoring surveys (Service 2006b, 2009b, 2010c, 2010d, 2015b). These areas include the northwestern corner of the ACEC in Stoddard Valley, the southwestern corner of the ACEC in Lucerne Valley, the northeastern corner of the ACEC adjacent to the Sunshine Peak Training Area, and the southeastern portion of the ACEC adjacent to the northern portion of the western expansion area (Bureau et al. 2005). These areas are continuous with areas of potentially higher desert tortoise abundance outside the ACEC. Trend analyses indicate that desert tortoise densities in the Ord-Rodman ACEC have declined from an estimated 2004 density of 8.2 large tortoises per square kilometer, to an estimated 2010 density of 5.0 large tortoises per square kilometer, to an estimated density of 3.6 large tortoises per square kilometer in 2014 (Service 2012g and 2015b). This decline represents a broader decline across all ACECs in the Western Mojave Recovery Unit in recent years. The Ord-Rodman ACEC is one of three desert tortoise conservation areas in the Western Mojave Recovery Unit. As a whole, these conservation areas have declined from a 2001 estimate of 7.6 to a 2014 average of 2.8 large desert tortoises per square kilometer. The Superior-Cronese and Fremont-Kramer ACECs have declined to approximately 2.4 and 2.6 large desert tortoises per square kilometer, respectively. The collective desert tortoise population size in these conservation areas is currently estimated to be approximately 17,644 large individuals (Service 2015b).

Line distance sampling conducted by the Service (2015b) in the Ord-Rodman ACEC utilizes a trend analysis, which provides a more accurate estimation of population size over time. For example, in the 2012 biological opinion the most recent data available was a point count estimate from 2010 for density in the Ord-Rodman of 7.5 large desert tortoises per square kilometer. Using a trend analysis that includes data through the 2014 sampling season, we are more accurately able to correct the 2010 density to 5.0 large desert tortoises per square kilometer. Using trend analysis from line distance sampling, Table 12 summarizes the abundance and density estimates for the Ord-Rodman ACEC from 2004 to 2014.

Table 12. Estimates of the number of large desert tortoises in the Ord-Rodman ACEC

Line Distance Sampling (Service 2015b)			
Year	**Tortoises in sampled area**	**Standard Error**	**Density (per square kilometer)**
2004	7,036	2299	8.2
2010	4,272	-	5.0
2014	3,064	1001	3.6

Older datasets from permanent study plots in the northwestern (Stoddard Valley Plot) and southwestern portions (Lucerne Valley Plot) of the Ord-Rodman ACEC have shown declines of 5 percent and 30 percent since the early 1980s, respectively (Bureau et al. 2005). We cannot extrapolate information from permanent study plots across large areas, but it provides us with a general idea of the population trends in the areas containing these plots. Although these data seem to indicate that population declines have been low in the northwestern corner of the ACEC, sign-count surveys performed in the late 1990s identified a 5-square-mile (13.0 square kilometer) die-off area in this region (Bureau et al. 2005).

Estimates of the desert tortoise densities in the areas containing these plots from the late 1970s were 19.3 to 38.6 and 7.7 to 19.3 per square kilometer, respectively (Berry and Nicholson 1984). Berry and Nicholson (1984) also noted a high-density area in the northeastern portion of the ACEC in the late 1970s, containing between 7.7 and 19.3 desert tortoises per square kilometer. The Service (1994) concluded that desert tortoise densities across most of the ACEC are much lower than that observed on the Stoddard Valley and Lucerne Valley permanent study plots and that the overall density for the ACEC as a whole was between 1.9 and 57.9 desert tortoises per square kilometer.

The preceding sections and tables provide the best available information regarding the number of desert tortoises within the existing installation and expansion areas, and within the Ord-Rodman ACEC. However, as we noted above the data for some areas (e.g., the existing installation) are more than 10 years old. These numbers do not provide information to characterize trends in population size and distribution. As discussed in this section, range-wide monitoring has documented declines in desert tortoise populations across much of its range with pronounced declines occurring in the Western Mojave Recovery Unit where the action area occurs. The following discussion provides information on trends in the number and distribution of desert tortoises within the action area. This information is important in assessing whether the effects of the proposed action are affecting declining, stable, or recovering populations.

Areas Affected by Translocation Activities

MEB Objective, High- and Moderate-Intensity Disturbance Areas - To support translocation planning, the Marine Corps conducted intensive surveys for desert tortoises, nests, and desert tortoise sign over more than 205 square kilometers in the MEB high- and moderate-intensity disturbance areas in the Western and Southern Expansion Areas (WEA and SEA), from September 2014 through October 2015 (Table 13). Surveys followed existing Service protocols (Service 2010e). To date, the Marine Corps has found 916 large and 507 small desert tortoises

during these surveys. Again, this equates to an estimated large desert tortoise (midline carapace length equal to or greater than 160 millimeters) density of approximately 4.5 individuals per square kilometer in the surveyed MEB high- and moderate-intensity disturbance areas. Not including the 285 small desert tortoises that will be kept in the TRACRS headstarting facility until they are large enough to be transmittered and translocated, the Marine Corps plans to translocate 1,138 desert tortoises to recipient sites in Spring 2017. This number may fluctuate due to mortality as well as additional desert tortoises being found in the disturbance areas. Using survey efficiency estimates (Karl 2002), the Marine Corps predicts that an additional 122 desert tortoises will be found and translocated during subsequent survey efforts. In total, the Marine Corps expects to translocate approximately 1,545 large and small desert tortoises.

Table 13. Cumulative number of desert tortoises expected to be translocated from MEB high- and moderate-intensity disturbance areas in the WEA and SEA

Tortoises:	**≥160 millimeters MCL[27]**			**<160 millimeters MCL**	
	Male	**Female**	**Unknown**	**Transmittered**	**TRACRS[28]**
Tortoises found during clearance surveys:					
WEA (MEB and High- and Moderate-Intensity Disturbance Areas)	457	334	43	218	285
SEA (High-and Moderate-Intensity Disturbance Areas)	41	40	1	4	0
Subtotal	*498*	*374*	*44*	*222*	*285*
Total for Size Group:		916		507	
Tortoises predicted to be found in MEB and High- and Moderate-Intensity Disturbance Areas within the WEA and SEA in future:					
On 13 square kilometers of private lands		12		6	
In subsequent clearance surveys[29]		70		34	
Total:		**998**		**547**	

[27] MCL=midline carapace length

[28] Desert tortoises with MCL approximately <112 millimeters will be kept in the TRACRS facility holding pens until of adequate size to be translocated.

[29] Based on Karl (2002) survey efficacy estimate that 74 percent of desert tortoises on a site will be found after one survey pass, and 93 percent of desert tortoises will be found after a second survey pass.

Translocation Recipient and Control Sites - The Marine Corps surveyed proposed recipient and control sites in Fall 2015 to radio transmitter desert tortoises for post-translocation monitoring and research. Table 14 contains population density and mortality data for each of these sites.

Table 14. Large desert tortoise population density and mortality rates for proposed recipient and control sites

Site	**Desert tortoise density (desert tortoises per square kilometer)**	**Desert tortoise mortality[30] (per square kilometer)**
Lucerne-Ord Recipient	5.2	<0.5
Rodman-Sunshine Peak North Recipient	4.9	2.0
Siberia Recipient	2.6	0.7
Broadwell Recipient	5.1	<0.3
Cleghorn Constrained Recipient	6.5	0.5
Rodman-Sunshine-Peak South Control	NA	NA
Daggett Control	NA	1.8
Calico Control	NA	NA
Ludlow Control	NA	0.7
Cleghorn Control	NA	0.5
Bullion Control	NA	NA

Areas Likely Affected by OHV Displacement

We have no current information on the status of desert tortoises in many of the site-specific locations that OHV displacement may affect. We anticipate that it mirrors the broader population status of the western Mojave Desert. To assess the status of the desert tortoise in the areas of the western Mojave Desert that OHV displacement is likely to affect, we evaluated information in Berry and Nicholson (1984), Bureau et al. (2005), Keith et al. (2005), and Service (2006, 2009b, 2010c, 2010d). In reviewing the information in these reports, we encountered the same issues that the Desert Tortoise Recovery Plan Assessment Committee (DTRPAC) confronted in 2004. In the executive summary of its final report, the DTRPAC (Tracy et al. 2004) stated:

> The assessment provides a highly detailed meta-analysis of desert tortoise population status and trends. The DTRPAC found the data on status and population trends often to be statistically unwieldy due to inconsistencies in data collection, suboptimal data collection design, and the truly daunting task of measuring animals that are difficult to detect and that occupy a harsh environment. Because much of the data currently available to address tortoise recovery was originally collected for purposes other than tortoise recovery, the DTRPAC analyses are meta-analyses using data of mixed quality. To adjust for very low statistical power in current data sets, DTRPAC used transect sampling carried out by various agencies and managers to derive tortoise occurrence data, then used spatial analysis of tortoise occurrence to map tortoise status and possible trends. Results are complex, but resulting maps suggest that in many areas tortoise populations appear be facing continued difficulty. Spatial analyses did not indicate zones of recovery. Kernel analyses of transect data – limited to only 1 year due to lack of additional

[30] Approximate mortality rate for desert tortoises over the 2012-2015 time period.

> sufficient data – identified several regions that may have experienced significant local die-offs. Statisticians consulting with DTRPAC derived an original analysis called "Conditional Probability of Being Alive" that spatially illustrated regions of low, intermediate, and high probability of encountering live tortoises during surveys. These analyses identified large regions within historic desert tortoise habitat as being associated with having a low probability of detecting live tortoises during surveys. In other words, probably few tortoises occur in these areas currently. The West Mojave recovery unit stood out within overall tortoise range as unambiguously experiencing continued population decline.

To illustrate the DTRPAC's findings, we have appended a graph that depicts trends in relative population density among permanent study plots in the western Mojave Desert and a map of the same area that depicts an analysis of the likelihood of finding a live desert tortoise (Appendix 2; from Tracy et al. 2004). We have labeled the map to indicate the areas where we expect displaced OHV use to occur. Because the summary is composed of information compiled through several different methodologies, we cannot use this information to show trends at any given site. As the assessment by the DTRPAC noted, however, the trend for desert tortoises in the Western Mojave Recovery Unit as a whole is one of decline; we have no reason to believe that the trends in the localized portions of the action area for this biological opinion differ.

The displacement of OHV use from the Johnson Valley OHV Management Area has occurred to other OHV areas in southern California at varying magnitudes. In most of these areas the level of displacement and the resulting increase in visitor use was generally low. Consequently, the increase in OHV use has likely resulted in little if any additional effects to desert tortoises. In the remaining portion of the Johnson Valley OHV Management Area and in the Stoddard Valley OHV Management Area, however, displacement and increases in visitor use was predicted to be significant. For Johnson Valley, it was estimated that 70 percent of existing use would be concentrated into an area 53.4 percent its original size, and for Stoddard Valley it was estimated that use levels would increase 22 percent due to displacement. These OHV areas are adjacent to populations of desert tortoises in the southwestern and northwestern portions of the Ord-Rodman ACEC, respectively, that are considered to be essential to the recovery of the species. As stated previously in this section, the desert tortoise density in the ACEC has declined to 3.6 large desert tortoises per square kilometer (Service 2015b), which is a level below that identified in the recovery plan for population viability. We anticipate that these increases in use have resulted in increased adverse effects in both authorized and unauthorized areas in the OHV areas and in the Ord-Rodman ACEC. Additional adverse effects due to OHV displacement are likely contributing directly to the ongoing decline in desert tortoise densities in the ACEC and in contiguous areas, as well as to a broader diminished baseline for the species in the Western Mojave Recovery Unit. However, because we do not have actual OHV use data or density data available for these specific areas of the ACEC we are unable to quantify what the current baseline conditions are for these populations.

The portion of the action area containing populations that are likely in the poorest condition and at the greatest risk is the California City and Rand Mountains Heavy Vehicle Use Area.

Although this area once contained among the highest densities in the recovery unit, this portion of the western Mojave Desert has experienced precipitous declines (up to 90 percent on some permanent study plots) since the late 1970s. Large die-off areas have also been documented in this area and in adjacent areas located in the northern portion of the Fremont-Kramer ACEC. Surveys in the late 1990s did not note above-average sign in this area.

The remaining portions of the action area (i.e., the Dove Springs, Jawbone Canyon, Spangler Hills, and Rasor OHV Management Areas and the East Sierra Heavy Use OHV Area) do not support habitat with a high potential for occupancy or they do not currently contain large numbers of desert tortoises. All of these areas, with the exception of the southeastern corner of the Spangler Hills OHV Management Area, have historically contained low desert tortoise densities when compared to other parts of the western Mojave Desert. More recent encounter rate data from the Spangler Hills OHV Management Area and density survey data from the Jawbone-Butterbredt ACEC indicate that population densities in these areas continue to remain low relative to other portions of the western Mojave Desert. ("Encounter rates" are the frequency at which desert tortoises are detected per unit distance of survey.) Because we have no information on population trends, we cannot determine if these low densities reflect a decline in desert tortoise numbers or maintenance of naturally low population densities. However, the southeastern portion of the Spangler Hills OHV Management Area was not identified as having above-average desert tortoise sign in the late 1990s.

It is difficult to determine the status of the desert tortoise populations in the El Mirage OHV Management Area. Surveys of the OHV area in the late 1990s detected high encounter rates, but not above-average sign of desert tortoises. During this survey, relatively few transects were performed in the OHV area, so the information on the encounter rate and sign count is not likely representative of the status of the desert tortoise within the OHV area.

Summary of the Status of the Desert Tortoise in the Action Area

Desert tortoises occur in low densities throughout much of the action area when compared to historical levels. The declines observed on permanent study plots, the large number of die-off areas, low site-specific densities in many areas, and low ACEC density estimates are all consistent with the early conclusions drawn by Tracy et al. (2004) that the Western Mojave Recovery Unit is in a state of overall population decline. However, the rate of decline, current population densities, and likelihood of maintaining viability are not uniform across the action area. The Service (1994) recommended a minimum viable population density threshold of 3.9 adult desert tortoises per square kilometer based on the premise that male and female desert tortoises were less likely to locate one another and reproduce below this density. A density of at least 3.9 adult desert tortoises per square kilometer is needed to protect against genetic deterioration and demographic stochasticity (Service 1994). Because a desert tortoise population's viability is primarily assessed by its ability to maintain a minimum viable abundance for the maintenance of evolutionary potential (5,000 individuals; Service 1994) and long-term population persistence (10,000 individuals; Service 1994) within a specified portion of the species' range, areas that show high abundance and density, persistent evidence of

occupation, lower population declines, and a lack of die-off areas have a greater chance of maintaining viability. Areas with low abundance and density, high rates of population decline, or areas showing evidence of substantial die-offs are at a higher risk of losing viability. We have summarized various pieces of information for the portions of the action area that would be affected by OHV displacement in Appendix 4. Below, we use this information in combination with the information discussed previously for MCAGCC, the expansion areas, and the Ord-Rodman ACEC to assess the relative potential for the maintenance of population viability in various portions of the action area.

Specific areas of severe decline include the western portion of the western expansion area, the California City and Rand Mountains Heavy OHV Use Area, the southern portion of the Silver Lakes Residential Vehicle Impact Area, and some portions of MCAGCC. The areas in and around Johnson Valley, El Mirage, California City/Rand Mountains, Coyote Corner, and Hinkley experienced die-offs that encompassed approximately 575.0 square kilometers. The Ord-Rodman ACEC has historically had higher and more stable densities than the other two ACECs in the Western Mojave Recovery Unit; however, it has experienced the same continuous and ongoing decline. Since the issuance of our 2012 biological opinion, density in the Ord-Rodman ACEC has declined from 5.0 (corrected value since 2012 consultation, see earlier discussion) to 3.6 large desert tortoises per square kilometer (Service 2015b).

At the time of the 2012 consultation, we believed desert tortoises in some areas had a better chance of maintaining viability in comparison to the rest of the action area and the Western Mojave Recovery Unit. These areas included: 1) the northwestern portion of the Ord-Rodman ACEC and northern end of the Stoddard Valley OHV Management Area, 2) the southwestern portion of the Ord-Rodman ACEC, 3) the northeastern portion of the Ord-Rodman ACEC and the Sunshine Peak Training Area, 4) the northern portion of the western expansion area and southeastern portion of the Ord-Rodman ACEC, 5) the vicinity of Emerson Lake in the Emerson Lake Training Area and the eastern portion of the western expansion area, 6) the Sand Hill Training Area, 7) the Bullion Training Area, and 8) the southern expansion area. This assessment was based on generally above-average densities, above-average desert tortoise sign, consistent location of desert tortoises during range-wide monitoring, lower documented declines on permanent study plots, or some combination of these. All of the above areas also lack any substantial die-off areas with the exception of the northwestern portion of the Ord-Rodman ACEC, where a small die-off area was documented near Daggett. MCAGCC also has several other isolated areas of relatively high density in the south-central West, Quackenbush, Gays Pass, and Prospect Training Areas. It is important to note that four of these eight areas are within or substantially overlap the Ord-Rodman ACEC, which is essential to recovery of the species. While we do not have more recent data for the above specified areas outside the Ord-Rodman ACEC, we have already noted that new information regarding the abundance and average density for surveyed areas within the ACEC indicates a continuous decline both before and since the 2012 biological opinion was written. We are unable to quantify the effects from the displacement of OHV use from the Johnson Valley OHV Management Area since the 2014 MCAGCC expansion resulting from the NDAA, but we anticipate that it has contributed to this decline.

The western portion of the western expansion area as well as areas of the Johnson Valley OHV Management Area that remains following the MCAGCC expansion seem to support viable populations that are declining in status at a faster rate and seem to be at a greater risk than the Western Mojave Recovery Unit as a whole. All of these areas continue to contain desert tortoises at low to moderate densities, they contain above-average sign of desert tortoise occupation, or they consistently contain desert tortoises during range-wide monitoring. However, these areas also either contain major die-off areas or they contain permanent study plots that have shown severe population declines in at least some portion of the area of interest. All of the heavy use OHV areas and recreational vehicle impact areas identified above occur in the southern or eastern portions of either the Superior-Cronese or Fremont-Kramer ACECs. As previously stated, both of these ACECs have estimated 2014 densities (i.e., 2.4 to 2.6 adults per square kilometer) that are below the minimum viable density threshold (Service 2015b). Both ACECs have been in continuous decline and have experienced major die-offs in their northern (Fremont-Kramer) and northwestern (Superior-Cronese ACECs) portions, and have large areas with no evidence of desert tortoise occupation (Service 2015b; Tracy et al. 2004).

EFFECTS OF THE ACTION

In the following section, we analyze the direct and indirect effects of the proposed action. In assessing the effects of military training, we have analyzed the modified training scenario (i.e., Marine Expeditionary Brigade [MEB]-level training and building block exercises) that the Marine Corps would implement following expansion. Combined Arms Exercises on the existing installation occur at annual levels (numbers of personnel and vehicles) and in locations similar to those identified for use in the modified training scenario. However, the new training scenario would result in fewer Combined Arms Exercises and a concentration of activities into two large-scale exercises each year (i.e., two MEB exercises). To address this concentration of training activities, we analyzed the effects of the modified training scenario on the existing installation along with the effects that would occur within the expansion areas.

We have also analyzed the Marine Corps' translocation strategy for desert tortoises and the beneficial and adverse effects, if any, of conservation measures the Marine Corps has proposed to implement to avoid, minimize, and offset effects to desert tortoises. We have analyzed the effects of the translocation program because the translocation of desert tortoises from the expansion areas is a result of the proposed action. Other agencies or individuals would implement several of the conservation actions; these actions would require and undergo future section 7 consultation and National Environmental Policy Act analysis as necessary. Because of the relative lack of detail and the future review required on these specific actions, our analysis of these actions is more general in nature.

Effects of Military Activities

Effects of the Preparation of Training Lands within the Expansion Areas

Prior to commencement of training activities, the Marine Corps would prepare the expansion areas by grading and improving roads, installing permanent features at the MEB objective, company objectives, and staging areas (i.e., bunkers, trenches, barbed wire, etc.), and installing additional fencing and signs at special use areas and other appropriate locations. The Marine Corps will perform clearance surveys of these areas and implement numerous measures to reduce the potential for injury or mortality of desert tortoises. However, because of the difficulty in locating desert tortoises, it is likely that clearance surveys will miss some large desert tortoises and most desert tortoises in smaller size classes. Construction would likely kill or injure these animals, but some potential exists that biological monitors or authorized biologists may locate and save a few animals during construction.

Accessing construction sites along existing paved and unpaved routes would likely result in injury or mortality due to vehicle strikes. The Marine Corps will implement protective measures, such as speed limits and driver awareness training, to reduce the potential for vehicle strikes, but it is unlikely that use of the access roads and speed limits would avoid all desert tortoises. This is particularly true of small individuals that are difficult to see.

The digging of permanent trenches and other excavations could kill or injure desert tortoises; once constructed, these features could entrap desert tortoises, which would likely kill these individuals if they are not rescued. The potential to kill or injure desert tortoises during construction is low because the Marine Corps will temporarily fence the construction site, employ authorized biologists to regularly inspect the excavations, and implement numerous other measures to reduce the potential for entrapment. However, upon completion of construction the Marine Corps would remove fences and desert tortoises could become entrapped.

Although the Marine Corps will translocate all desert tortoises found during clearance surveys of construction sites, it may miss some that are hidden or off-site when surveys occur. Some of these desert tortoises are likely to have home ranges that overlap habitat within the construction site. When fences are installed that block their access, animals may exhibit fence-pacing behavior that places them at a greater risk of injury or mortality due to exposure to temperature extremes and predators. The Marine Corps will implement specific minimization measures to address desert tortoises that exhibit this type of behavior (including regular monitoring of the fences after they are installed). These measures are likely to reduce the potential for injury and mortality during construction.

Temporary fencing may prevent desert tortoises from using a portion of their home ranges for some time. Although construction inside the fencing would not directly affect these animals, project activities may damage their home ranges through loss of foraging and sheltering sites. This loss of habitat may result in a decreased chance of survival because of the diminished resources; desert tortoises may also die as they shift their home ranges into new areas with which

they are unfamiliar. This readjustment could also lead to adverse social interactions with desert tortoises in adjacent areas (e.g., increased fighting as males compete for females and resources).

The preparation of training lands would attract common ravens to construction sites. The Marine Corps will implement numerous measures to control common raven subsidies during construction that may reduce this effect. However, construction activities are still likely to result in some increase in predation of desert tortoises by common ravens. Given that common ravens will fly great distances for water, they could affect a substantial area of adjacent lands. If construction sites are in locations that currently experience substantial human activities (i.e., MCAGCC and southern portion of western expansion area), the increase in the number of common ravens and the subsequent increase in predation attributable to the expansion is likely to be marginal; however, the converse is also true.

We cannot quantify the precise number of desert tortoises that the preparation of training lands would kill or injure for the following reasons. First, we do not know the ultimate location where construction of training features would occur, so we cannot assess site-specific population size, baseline levels of human disturbance, or other variables. Second, we cannot quantify the extent to which the proposed minimization measures will reduce injury and mortality. Third, we cannot predict the proportion of desert tortoises present during construction activities that clearance surveys would find. Finally, we cannot predict the number of desert tortoises with home ranges that may overlap construction site boundaries. Although precise estimation of injury and mortality is not possible, we have provided a rough characterization of its magnitude below (see Quantification of Effects Related to Military Activities).

Effects of Expanded Training Activities

Training exercises would have similar effects to those discussed in the previous section, but these effects would likely be more intense and affect a larger portion of the action area over a longer period. Use of existing routes on MCAGCC and the expansion areas during training is likely to result in injury and mortality of desert tortoises due to vehicle strikes. Cross-country vehicle travel is also likely to injure or kill unobserved desert tortoises that are above ground or in their burrows; foot travel may injure or kill small desert tortoises (e.g., hatchlings) that are difficult to see. Excavation of temporary trenches and fighting positions would likely kill or injure desert tortoises in their burrows; desert tortoises may also be entrapped in these trenches when they are not in use.

The Marine Corps will implement several measures during training to reduce the magnitude of these effects. The primary measure for minimizing direct effects will be translocation of desert tortoises out of areas that would experience high- and moderate-intensity levels of disturbance, such as the MEB objective, company objectives, main supply routes, and staging areas. The biological assessment provides a representative depiction of these areas (Figure 6-2; DoN 2011a), but the Marine Corps has not determined the final location of these activities. Although training would be concentrated around these high- and moderate-intensity disturbance areas, the training activities, including cross-country travel, could occur in most parts of the expanded

installation at lower levels. As noted in the Consultation History section of this biological opinion, the Marine Corps relocated the staging area in the southern expansion area to avoid areas of higher desert tortoise density.

Translocation will reduce the number of desert tortoises injured or killed due to training activities by removing them from areas where most direct effects would occur in the expansion areas. The Marine Corps is likely to translocate most of the large desert tortoises (i.e., defined as those animals with midline carapace length equal to or greater than 160 millimeters, as described in the Status of the Desert Tortoise Section in the Environmental Baseline). However, authorized biologists are unlikely to find and translocate most desert tortoises in smaller size classes, and we do not expect desert tortoise eggs to be found during clearance surveys. Because the Marine Corps would not translocate desert tortoises from the existing installation, this measure would not reduce injury and mortality in that portion of the action area.

Because the Marine Corps would not permanently exclude desert tortoises from cleared areas, individuals in adjacent habitat may be injured or killed when they enter these areas later. To reduce the magnitude of this effect, the Marine Corps will conduct annual clearance-level surveys in portions of the high- and moderate-intensity disturbance areas that currently support two or more desert tortoises per square kilometer. As described in the Minimization Measures section of the Project Description, these surveys have been enhanced since the 2012 biological opinion in order to remove more desert tortoises from high- and moderate-intensity disturbance areas and minimize the potential for injury or mortality. However, given the limitations of clearance surveys that we have previously discussed, the Marine Corps is unlikely to find all desert tortoises within these areas. Additionally, if the training occurs during periods when desert tortoises are active, individuals could enter the training areas between the time the surveys are conducted and the conclusion of the military exercises.

In addition to translocation, the Marine Corps will implement numerous additional measures prior to and during training exercises (e.g., environmental awareness training, inspecting under vehicles prior to moving them, moving desert tortoises out of harm's way, etc.). These measures would likely reduce the potential for injury and mortality of desert tortoises that are missed by clearance surveys and that enter the area after clearance surveys are complete. However, because the focus of the Marine Corps during exercises will be training, desert tortoises are still likely to be injured or killed.

Training exercises are also likely to result in numerous indirect effects to desert tortoises. Cross-country travel would likely collapse unoccupied burrows and other cover sites, leaving desert tortoises prone to injury or mortality from exposure, predation, or other threats. Areas of concentrated use, such as staging areas, the MEB objective, company objectives, and re-supply points, are likely to attract common ravens that would prey on desert tortoises in the surrounding area.

Habitat degradation because of long-term use of the training lands would facilitate the spread of non-native weeds that may eliminate or reduce the prevalence of native forage species for the

desert tortoise. The reduction in the amount of suitable native plants could affect the reproductive success of desert tortoises remaining in these areas post-translocation, and may make them more susceptible to disease. The spread of non-native weeds may also increase the prevalence of wildfires, which could directly kill desert tortoises and further reduce resources (i.e., shrubs that animals use for shelter, forage species) within existing home ranges.

The identified effects to habitat would degrade resources within existing desert tortoise home ranges in these areas. Survival rates for desert tortoises on the MCAGCC installation and the expansion areas would likely decrease because of reduced resources. The loss or degradation of habitat may also result in injury or mortality as desert tortoises adjust their home ranges into new areas with which they are unfamiliar because they would experience increased exposure to predators, temperature extremes, and aggressive interactions with resident animals.

The Marine Corps predicts the direct loss or high-intensity disturbance of 116.6 square kilometers of desert tortoise habitat and the moderate-intensity disturbance of an additional 390.5 square kilometers on the MCAGCC installation and the expansion areas (DoN 2011a). Table 15 provides information on how much of this habitat loss and degradation would occur in various portions of the action area. Many of these areas are already in various stages of habitat degradation due to existing military training or OHV effects.

Table 15. Habitat disturbance associated with the existing MCAGCC installation and expansion areas

Area	Habitat Loss or High-intensity Disturbance (square kilometers)[31]	Moderate-intensity Disturbance (square kilometers)[32]
MCAGCC Installation	73.8	280.1
Western Expansion Area	39.1	99.8
Southern Expansion Area	3.7	10.6

The Marine Corps will implement numerous measures to reduce the magnitude of the adverse effects of training. Environmental awareness programs, concentration of training activities within previously disturbed areas, filling of temporary excavations following training exercises, and containment of predator subsidies will reduce the magnitude and extent of these effects to some degree. However, these effects are still likely to occur, albeit at a lower level than without the proposed measures.

We cannot quantify the precise number of desert tortoises that training exercises would kill or injure for several reasons. First, we do not know the ultimate location of the MEB objective, company objectives, staging areas, or other features where the majority of training disturbance would occur, so we cannot assess site-specific population size, baseline levels of human disturbance, or other variables. Second, we cannot predict the number of desert tortoises that are likely to enter high- and moderate-intensity disturbance areas from adjacent areas between the

[31] Incorporates all areas of "High-intensity Habitat Disturbance" identified by the Marine Corps (DoN 2011a)
[32] Incorporates all areas of "Moderate-intensity Habitat Disturbance" identified by the Marine Corps (DoN 2011a)

time clearance surveys are conducted and the start of military training. Third, we have limited information on the anticipated magnitude of disturbance in areas away from the MEB objective and other primary training features. Fourth, data used to estimate the number of desert tortoises that could be affected by training activities on the existing installation is based on data from the late 1990s and training on the installation has likely reduced the actual number of affected animals since that time. Finally, we cannot quantify the extent to which the proposed minimization measures would reduce injury and mortality during training. Although precise estimation of injury and mortality is not possible, we have provided a rough characterization of its magnitude below (see Quantification of Effects Related to Military Activities).

Effects of Training Range Maintenance

Following training exercises, the Marine Corps and its civilian contractors would perform maintenance activities, such as range clean up, ordinance disposal, target maintenance, and road grading. These activities would occur primarily along existing routes or within areas that training activities have disturbed, but some low level of cross-country travel would occur occasionally. The Marine Corps will implement numerous measures designed to reduce the potential for injury and mortality of desert tortoises. Effects similar to those discussed above are likely to occur during training range maintenance, but these effects would be substantially less intense because of the lower scale of human activity within desert tortoise habitat, the lower level of cross-country vehicle travel, and the performance of most of these activities in previously disturbed areas.

We cannot quantify the precise number of desert tortoises that training range maintenance is likely to kill or injure for the reasons we have identified previously in this biological opinion. Although we cannot precisely estimate the number of desert tortoises that are likely to be injured or killed, we have provided a rough characterization of its magnitude below (see Quantification of Effects Related to Military Activities).

Quantification of Effects Related to Military Activities

The various military activities discussed above would occur in the same areas over the life of the training program, which the Marine Corps estimates to be 50 years. Consequently, we have provided an estimate of the cumulative injury and mortality that would result from all of these effects, rather than try to assign specific numbers to each activity. This estimate accounts for injury and mortality associated with MEB and Building Block exercises and for future Combined Arms Exercises that would occur in the same areas at a decreased annual frequency. To arrive at our estimates, we have used the population estimates for various portions of the action area, information on the effectiveness of clearance surveys, the characteristics of populations of desert tortoises occurring on lands currently used for training on MCAGCC, and information on the intensity of training.

Table 16 provides estimates for the number of desert tortoises within areas that it would disturb through training activities (DoN 2011a). We based the estimates for large desert tortoises on

survey results and a GIS analysis of a representative training scenario (i.e., figure 6-2; DoN 2011a). Because biologists do not reliably find most small desert tortoises during surveys, we used a life table analysis to estimate the numbers of small desert tortoises. We expect the estimates provided in Table 16 likely overestimate the abundance of small desert tortoises in the areas to be disturbed by military activity because of the following reasons, as described in the Environmental Baseline: 1) the life table has limited predictive ability because it assumes invariant schedules of reproduction and death and constant annual rates of increase or decrease in size; 2) the life table assumes that current egg production and survival rates in our action area are similar to that on the Goffs study site in the early 1980s; and 3) differences in resource availability, threats, climate and weather phenomena, and a variety of other variables can result in differences in the overall mortality rate of individuals at different sites and times and thereby create differences in the proportion of the population composed of individuals in these smaller classes. For the purpose of our analysis, we have used the point estimates provided in these tables.

Table 16. Estimates of the number of desert tortoises on the existing and expanded MCAGCC installation (based on DoN [2011a]). The upper number represents the point count; the lower number is the 95 percent confidence interval.

Area	**Disturbance Class**	**Population Estimate**	
		Large Desert Tortoises	**Small Desert Tortoises**
Existing Installation	High-intensity	312 23-602	1,471 108-2,838
	Moderate-intensity	1,226 119-2,333	5,779 561-10,997
Western Expansion Area	High-intensity	276 139-547	1,301 655-2,578
	Moderate-intensity	724 365-1436	3,413 1,077-6,769
Southern Expansion Area	High-intensity	26 10-70	66 47-85
	Moderate-intensity	79 30-209	372 141-985
Total		2,838 686-5,197	9,564 2,589-24,252

Military Activities in Areas Identified for High- and Moderate-intensity Disturbance on the Existing Installation

The Marine Corps will not translocate desert tortoises from training areas on the existing installation, so military activities will affect all animals within areas identified for high- and moderate-intensity disturbance on MCAGCC (Figure 6-2; DoN 2011a). We anticipate that injury and mortality will be greater in high-intensity disturbance areas than in moderate-intensity disturbance areas. However, we anticipate that desert tortoises would continue to occupy all but the most heavily disturbed locations, albeit at lower densities.

Woodman et al. (2001) found that abundance of desert tortoises was lower in areas where more than 400 vehicle tracks per mile (250 per kilometer) were present; approximately 18.9 percent of MCAGCC exhibited such track density. Desert tortoises were absent from areas of MCAGCC that had more than 700 tracks per mile (438 per kilometer; 6.6 percent of MCAGCC). When contemplating the portions of MCAGCC that no longer support desert tortoises, bear in mind that a substantial portion of the base [approximately 27.5 percent] is too mountainous to allow training; these areas also likely support few, if any desert tortoises. Also, low elevation areas had little or no sign, regardless of vehicle activity, suggesting that desert tortoises likely did not use these areas extensively (Woodman et al 2001). Henen (2012e) also noted a relationship between high numbers of vehicle tracks and lower desert tortoise densities when re-analyzing these data. However, this analysis indicated that desert tortoises continued to occupy areas of existing heavy use. Table 17 provides density estimates from the Henen (2012e) analysis.

Table 17. Desert tortoise densities in relation to track counts on MCAGCC

Disturbance Level	**Track Count**[33]	**Mean Density (large individuals per square kilometer)**[34]		**Density Range (large individuals per square kilometer)**
Very High	> 700 per mile	0.8	3.3	0.3 to 1.3
High	400 to 699 per mile	4.8		2.7 to 7.0
Moderate	100 to 399 per mile	6.0		4.8 to 7.3
Low	<100 per mile	4.9		4.2 to 5.5

Woodman et al. (2001) observed that large amounts of denuded or partially denuded habitat were associated with areas containing large numbers of vehicle tracks. Of 17 transects that were completely or partially denuded, 16 contained more than 700 vehicle tracks. In the biological assessment, the Marine Corps anticipates that the high-intensity disturbance portions of the representative training scenario will result in a complete or near complete loss of vegetation and disruption of the soil surface. Because this definition closely approximates previous observations of denuded areas in locations with more than 700 tracks per mile (438 per kilometer), observed desert tortoise densities in these areas are likely to approximate what we would see within areas that are heavily disturbed under the proposed action. Consequently, we anticipate that all portions of the representative training scenario identified for high-intensity disturbance will decrease to a density of between 0 to 0.8 large desert tortoises per square kilometer over the next 50 years due to the effects of military activities.

Prior to beginning our analysis, we would like to make two key points. First, we cannot attribute the low densities that Woodman et al. (2001) observed solely to military activities. We note, however, that Woodman (2012) states that the Marine Corps' increased protection of the Sand

[33] Track count is provided in standard units (number of tracks per mile) to reflect the unit of measurement used in the Woodman et al. research.

[34] We provided both the individual and combined values for mean density for the very high and high disturbance levels. Density is provided in metric units (number of tortoises per square kilometer) to maintain consistency with current Service draft translocation guidance (Service 2016b) and with other sections in the biological opinion.

Hills plot over the last 5 years seems to have resulted in a more stable population. Although military training is responsible, at least in part, for the lower densities in some areas, these desert tortoises are also subject to many of the same stresses that animals face elsewhere in the Western Mojave Recovery Unit, where the abundance of desert tortoises in surveyed tortoise conservation areas declined by approximately 51 percent from 2004 to 2014 (Service 2015b). Second, we expect that the rate of decline in the density of desert tortoises would be greater at the onset of training and then gradually slow over time; we do not expect the decline to occur at a linear rate. In the following analysis, we will not attempt to predict how many desert tortoises would be affected within any specific period.

Areas of High-intensity Disturbance - Areas that would receive high-intensity disturbance cover approximately 73.8 square kilometers within MCAGCC and currently contain approximately 312 large desert tortoises (4.3 per square kilometer). A decrease in density from 4.3 to 0.8 large desert tortoises per square kilometer would result in an 81.4 percent decline; this decline equates to the loss of 254 individuals. If training extirpated desert tortoises from these areas, this 100 percent decline would equate to the loss of 312 individuals. The magnitude of the decline does not directly equate to anticipated mortality. To equate the two directly, we would need to assume that the current population of 312 individuals would remain stable in the absence of military activities (i.e., recruitment rate would equal natural mortality rate and that the immigration rate balanced that of emigration) and that military activities would be the only source of added mortality. As mentioned previously, the rate of decline in desert tortoise abundance in areas surveyed in the Western Mojave Recovery Unit from 2004 to 2014 has been approximately 51 percent.

We anticipate that the existing populations in areas identified for high-intensity disturbance are currently declining given the current effects on MCAGCC and the declining status of populations in the Western Mojave Recovery Unit. Military activities are likely to be the greatest source of mortality in the high-intensity disturbed areas. Consequently, we anticipate that mortality of 254 to 312 large desert tortoises is a reasonable estimate of the maximum number of large desert tortoises that military activities are likely to kill in areas identified for high-intensity disturbance on MCAGCC. We also anticipate that this estimate is a worst case scenario based on the documented decline in the Western Mojave Recovery Unit since these abundance data were collected. It is likely that the baseline number of individuals present on the existing MCAGCC installation is lower than this estimate.

We have no data on the degree to which the number of small desert tortoises could decrease. However, if the number of large animals decreases as we predict, the number of small desert tortoises is also likely to decrease at a similar rate due to direct mortality and because fewer reproductive females will occur in the population, which will result in a lower reproductive output. If the number of individuals in the two size classes decreases by the same magnitude, the current number of small desert tortoises would decrease by 81.4 to 100 percent in high-intensity disturbance areas. This would equate to a decline in the current population size of 1,197 to 1,471 small desert tortoises. This decline would result from mortality rates and/or recruitment rates among small animals exceeding reproductive output of the adult females.

Equating this decline with mortality or lost reproductive output caused by the proposed military activities assumes that the small desert tortoise population would have remained at a constant size from year-to-year (i.e., annual reproductive output would equal annual mortality/recruitment) in the absence of military training. Consequently, use of this number assumes a currently stable small desert tortoise population and assumes that the effects of military activities would be the only source of added small desert tortoise mortality and decreased reproductive output within the population. As stated previously, we anticipate that the existing population is declining, and we anticipate that military activities would be the greatest source of mortality in the high-intensity disturbance areas. Consequently, we anticipate that the loss of 1,197 to 1,471 small desert tortoises in these populations will be the result of mortality or loss of reproductive output associated with the proposed military activities. For the reasons described earlier pertaining to the ongoing decline in desert tortoise abundance in the Western Mojave Recovery Unit, we again anticipate that this number is a worst case scenario. It is likely that the baseline number of individuals present on the existing MCAGCC installation is lower than this estimate. We are not providing an estimate of the number of desert tortoise eggs that will be lost due to military training due to the following reasons: 1) as previously noted, we do not expect that eggs will be located during clearance surveys; 2) we do not expect that eggs will be located during military training activities; and 3) as we have previously discussed, it is difficult to estimate the number of small desert tortoises in a given area (due to difficulties in survey detection, generally low hatching success rate and survivability, and high variability in numbers given resource conditions), and estimating the number of eggs would result in even more variable and uncertain outcomes. We anticipate that the loss of eggs would not be significant at a population level because of the high rates of natural loss and mortality of eggs and smaller class sizes and the resulting low number of individuals that survive to a reproductive size.

Areas of Moderate-intensity Disturbance - The Marine Corps defined moderate-intensity disturbance areas in its representative training scenario as areas where distance between plants would be noticeably increased, plants would have smaller canopies, and soil surface disruption would be present but not extensive. We anticipate that this change in vegetation would affect desert tortoise abundance in higher density areas. As discussed above, the abundance of desert tortoises decreased substantially in areas where the density of vehicle tracks per mile exceeds 400 (250 per kilometer; Woodman et al. 2001, Henen 2012e).

Henen (2012e, see Table 15 above) determined that areas of MCAGCC containing more than 400 vehicle tracks per mile (250 per kilometer) contained a density of 8.5 large desert tortoises per square mile (3.3 per square kilometer). Although this density is an average across all transects containing more than 400 tracks per mile (250 per kilometer), including those with more than 700 per mile (438 per kilometer), it provides a reasonable estimate of the density that is likely to occur under the moderate-intensity disturbance training scenario presented by the Marine Corps.

Based on this information, we estimate that the current number of large desert tortoises within the portions of MCAGCC identified for moderate disturbance would decrease from 1,226 to 924

(i.e., population estimate of 1,226 large desert tortoises in moderate-intensity disturbance areas; decline equates to a projected average density of 3.3 desert tortoises per square kilometer in moderate-intensity disturbance areas multiplied by 280 square kilometers, which is the total size of moderate-intensity disturbance areas) for a loss of 302 large desert tortoises. As discussed previously, we cannot attribute this decline solely to military activities and the magnitude of the decline does not directly equate to the amount of anticipated mortality that is likely to result from the expanded training. In areas where moderate-intensity disturbance is likely to occur, other sources of mortality, unrelated to military activities, are likely to play a more pronounced role in population declines than they will in high-intensity disturbance areas. Therefore, the proportion of the decline that we can attribute to mortality from military activities will be lower than in the high-intensity disturbance areas. Consequently, as a reasonable worst-case scenario, we anticipate that military activities will kill 302 large desert tortoises in moderate-intensity disturbance areas of MCAGCC. Again, for the reasons described earlier pertaining to the ongoing decline in desert tortoise abundance in the Western Mojave Recovery Unit, we again anticipate that this number is a worst case scenario. It is likely that the baseline number of individuals present on the existing MCAGCC installation is lower than this estimate.

We have no data on the degree to which the population of small desert tortoises could decrease in moderately disturbed portions of MCAGCC. However, if they decrease by the same magnitude as the large animals, the number of small animals would decrease by 24.6 percent in moderate-intensity disturbance areas of MCAGCC. This decrease would equate to a loss of 1,422 (equates to 24.6 percent of 5,779; see Table 14) individuals. As in the high-intensity disturbance areas, this decline would result from mortality rates and/or recruitment rates that exceed the reproductive output of the adult females. In areas of moderate-intensity disturbance, we anticipate that military activities are likely to contribute to this decline by directly killing some small desert tortoises and by decreasing the number of reproductive females. However, other sources of mortality, unrelated to military activities, are likely to play a more pronounced role in the moderate-intensity disturbance areas than in those of high-intensity disturbance.

Consequently, as a reasonable worst-case scenario, we anticipate that military activities will kill 1,422 small desert tortoises in areas moderate-intensity disturbance on MCAGCC; this amount is likely an overestimate, given the ongoing decline in the Western Mojave Recovery Unit and especially given the difficulties in estimating the number of small desert tortoises described above. Table 18 depicts our estimates of the number of desert tortoises that training would likely kill within the current boundaries of the MCAGCC.

Table 18. Estimates of the number of desert tortoises likely to be killed within the current boundaries of the MCAGCC

Area	Large Desert Tortoises	Small Desert Tortoises
High-intensity Disturbance Areas	254 to 312	1,197 to 1,471
Moderate-intensity Disturbed Areas	302	1,422
Total	556 to 614	2,619 to 2,894

Although the estimates in this table are the result of a reasonable application of the best available data, they contain numerous sources of potential error. First, we have based these estimates on survey data that are more than 10 years old. Second, the Marine Corps based its estimates of the current population size within areas identified for high-intensity or moderate-intensity disturbance on broad generalizations of density across the landscape that do not account for existing site-specific disturbances (e.g., existing roads, staging areas, areas of high level cross-country vehicle travel) that may result in lower densities in specific locations. Third, estimates of small desert tortoise population size derived using Turner et al. (1987) likely overestimate the current number of small desert tortoises. Fourth, the Service estimates assume that the level of military training determines the density of desert tortoises, which likely ignores other sources of mortality that may influence density. Fifth, the Service's density estimates assume a stable state for populations of desert tortoises (e.g., 2.0 adults per square mile/0.8 adults per square kilometer is a density indicative of an area with 700 tracks per mile/438 tracks per kilometer). Our estimates, however, only reflect the density at the time the surveys were performed and ignore the potential that these populations are continuing to decline due to the level of disturbance. Sixth, the correlation of desert tortoise density to track counts is based on survey data collected at the same time that the population estimate surveys were performed. Therefore, it is more accurate to say that these densities reflect a fine-scale look at the disturbed portions of the area where population estimation occurred rather than the probable decline in density that may occur under the new training scenario. Although these sources of error only allow for a rough characterization of the injury and mortality that may occur from the proposed action, these sources of error would tend to overestimate the level of injury and mortality that military activities will cause.

Military Activities in Areas Identified for High- and Moderate-intensity Disturbance in the Expansion Areas

The Marine Corps will translocate desert tortoises from the areas identified for high- and moderate-intensity disturbance within both expansion areas, so military activities will only injure or kill the animals that are not located during clearance surveys. The Marine Corps is not likely to detect all of the individuals that are present during clearance surveys because desert tortoises in general are difficult to find and small animals in particular are very difficult to detect. Table 19 compares pre-project survey estimates and data on located desert tortoises for Units 2 and 3 of the Ivanpah Solar Electric Generating System (ISEGS) facility, which provides information that we use in our analysis for estimating the number of individuals that the Marine Corps is likely to miss during clearance surveys.

Similar information is also available from Fort Irwin, where the Army predicted that its southern expansion area supported between 526 and 565 adult desert tortoises on approximately 22, 214 acres. To date, it has found 565 desert tortoises greater than 160 millimeters in length on approximately 19,643 acres. The Army also found 103 desert tortoises smaller than 160 millimeters in this area (Service 2012c). Given the number of individuals larger than 160 millimeters located during these clearance surveys, and the large proportion of the population

that individuals smaller than 160 millimeters generally comprise, it is likely that the Fort Irwin clearance surveys located only a small proportion of the small individuals.

Table 19. Numbers of desert tortoises estimated and found at the ISEGS facility

Midline Carapace Length (millimeters)	Pre-project Desert Tortoise Population Estimate[35]	Desert Tortoises Located During Clearance and Construction Monitoring[36]	Percentage of Estimate Located	
0 - 119	467/555	54	11.7/9.7	13.5/11.5 (total for 0-159)
120 - 159	30	13	43.0	
> 160	64	55	85.9	

Based on the information above, we expect that clearance surveys and subsequent construction monitoring generally locate most of the estimated number of large desert tortoise individuals; the percentage of the estimate located decreases for smaller size classes. This outcome is logical because small desert tortoises are more difficult for surveyors to locate. We noted in the Environmental Baseline section of this biological opinion as well as for Table 19 in this section that the use of Turner et al. (1987) and life table estimation techniques likely cause us to overestimate the number of desert tortoises in the smaller size classes.

The Marine Corps has already performed a clearance survey in high- and moderate-intensity disturbance areas according to Service protocols, has attached radio transmitters *in situ* to all desert tortoises that will be captured and translocated in Spring 2017, and has transferred all animals too small for transmittering to the Marine Corps' Tortoise Research and Captive Rearing Site (TRACRS) headstarting facility for care until they are of adequate size to be translocated. The Marine Corps will supplement this effort by conducting annual enhanced clearance surveys in higher density areas (i.e., as defined in the Minimization Measures section in the Project Description, areas that have a density of two or more large desert tortoises per square kilometer) that overlap the high- and moderate-intensity disturbance portions of the expansion areas during the desert tortoise active season prior to each MEB exercise. We anticipate that the Marine Corps will locate most of the large animals (i.e., at least 85.9 percent; see table 19). Based on the survey efficiency data from the ISEGS project, we anticipate that the Marine Corps may also locate approximately 13.5 percent of the individuals smaller than 160 millimeters, which is the percentage of the estimated number of small animals that were detected at the ISEGS site. Most of these animals will be in size classes that are larger and therefore closer to reproductive age. However, this estimate for the number of small desert tortoises that will be found is likely an overestimate due to the intensive survey measures implemented at the ISEGS facility specifically

[35] Numbers based on Service 2011d (8-8-10-F-24R). This biological opinion grouped hatchlings (i.e., smaller than 49.7 millimeters) and eggs together into a single estimate. The first row of this column reports individuals 119 millimeters or smaller, which includes hatchlings and eggs. The larger number assumes that all individuals smaller than 49.7 millimeters are still in egg form, while the smaller number assumes that all viable eggs have hatched and become the hatchling portion of the population. The predicted number of hatchlings assumes a 55 percent egg-hatching rate per Turner et al. (1987).

[36] Numbers based on Jackson (2012).

to locate small animals (e.g., excavating rodent burrows and other non-tortoise burrows where small desert tortoises are more likely to be found); the Marine Corps will conduct Service-protocol clearance surveys which do not prescribe for such measures, hence fewer small desert tortoises are expected to be located.

Table 20 contains estimates from our 2012 biological opinion, uses data from Table 16 and an expected survey efficiency of 85.9 percent (as previously described), and estimates the number of desert tortoises that have been found during clearance surveys versus the number likely to remain in the high- and moderate-intensity disturbance areas. We based these estimates on the number of desert tortoises in these areas and the efficiency of clearance surveys from the ISEGS project, because this clearance was the most-recent, large-scale clearance conducted and, as such, benefitted from work that preceded it (e.g., Fort Irwin). Despite the fact that the information from the ISEGS project comprises the best available data, we identified several factors that could cause the results to differ between that project and the proposed action. These factors include:

1. The proposed high- and moderate-intensity disturbance areas in the expansion areas are more than four times the size of the ISEGS project; as the area to be cleared of desert tortoises increases, so does the difficulty in finding all desert tortoises that are present.

2. As stated previously, biologists searched the ISEGS site more thoroughly than required by the Service's protocols and employed intensive search techniques to find small animals.

3. The removal of vegetation from the ISEGS site as construction progressed allowed for the discovery of additional desert tortoises; the Marine Corps will not remove vegetation from the training areas prior to military maneuvers.

Because Table 20 was based in part on Turner et al. (1987), we again remind the reader of the predictive limitations of this method of estimating the number of small animals. By using Turner et al. (1987), we have likely overestimated the number of small desert tortoises; consequently, our estimate of the number of small desert tortoises remaining after clearance surveys is also likely an overestimate. Despite developing these tables with the best available information, we do not know the exact number of desert tortoises that would be present before and after translocation.

Table 21 uses the estimates from Table 20 and compares the number of large and small desert tortoises that we estimated to be found in our 2012 biological opinion with data from the actual clearance surveys that have since taken place. We expect that the numbers in Table 21 provide a reasonable worst-case scenario for our analysis because: 1) we have likely overestimated the number of small desert tortoises that are present; 2) biologists have been searching the proposed high- and moderate-intensity disturbance areas in the expansion areas during the 3 years pre-translocation studies; and 3) the Marine Corps will conduct additional and enhanced clearance surveys in high density desert tortoise areas prior to each MEB exercise, during which an additional 82 large desert tortoises and 40 small desert tortoises are expected to be found. We

base this latter estimate on the survey efficiency expectation that 74 percent of individuals will be located on the first survey pass, and 94 percent will have been cumulatively located after the second survey pass (Karl 2002).

Table 20. Estimates for the number of desert tortoises before and after translocation

Area	Area Size (square kilometers)	Pre-Clearance Estimates		Post-Clearance Estimates	
		Number of Animals	Density (per square kilometer)	Number of Animals Remaining	Density (per square kilometer)
Large Desert Tortoises (Projected Clearance Efficiency=85.9 percent)					
Western Expansion Area					
High-intensity Disturbance	39.1	276	7.1	39	1.0
Moderate-intensity Disturbance	99.8	724	7.3	102	1.0
Southern Expansion Area					
High-intensity Disturbance	3.7	26	7.0	4	1.1
Moderate-intensity Disturbance	10.6	79	7.5	11	1.0
Small Desert Tortoises (Projected Clearance Efficiency=13.5 percent)					
Western Expansion Area					
High-intensity Disturbance	39.1	1,301	33.3	1,125	28.8
Moderate-intensity Disturbance	99.8	3,413	34.2	2,952	29.6
Southern Expansion Area					
High-intensity Disturbance	3.7	66	17.8	57	15.4
Moderate-intensity Disturbance	10.6	372	35.1	322	30.4

Table 21. Estimates for the number of desert tortoises before and after translocation using current clearance survey data[37]

Area	Area Size (square kilometers)	Pre-Clearance Estimates (From Table 23)		Post-Clearance (Based on Actual Number of Animals Found)		
		Number of Animals Estimated	Density (per square kilometer)	Number of Animals Actually Found	Estimated Number of Animals Remaining	Estimated Density (per square kilometer)
Large Desert Tortoises						
Western Expansion Area	138.9	1,000	7.2	834	166	1.2
Southern Expansion Area	14.3	105	7.3	82	23	1.6
Small Desert Tortoises						
Western Expansion Area	138.9	4,714	33.9	503	4,211	30.3
Southern Expansion Area	14.3	438	30.6	4	434	30.4

[37] High- and moderate-intensity disturbance are combined due to the potential for desert tortoises to have overlapping ranges between the areas and the resulting uncertainty of determining true densities.

The estimated numbers and the effects analysis for large and small desert tortoises in our 2012 biological opinion were conducted separately for the high- and moderate-intensity disturbance areas within the western and southern expansion areas (see Table 20). Table 21 merges the clearance survey data for high- and moderate-intensity disturbance areas within each expansion area. This was done because desert tortoises occupying home ranges near the boundaries of the high- and moderate-intensity disturbance areas likely overlap each area, as well as likely overlap with areas outside the disturbance areas, and it would be difficult to allocate an accurate number of animals found during clearance surveys to each respective area.

Table 22 provides a further summary of the number of large and small desert tortoises that were estimated to be present in high- and moderate-intensity disturbance areas in the 2012 biological opinion, the number of desert tortoises in each size class and area that we estimated to be found during clearance surveys, and the actual number of desert tortoises that were found during clearance surveys from 2012 to 2015. Again, the number of tortoises estimated was based on survey efficacy data from the ISEGS project, which was the most recent large-scale protocol-level clearance survey conducted.

Table 22. Comparison of estimates for desert tortoise presence and survey efficacy in each expansion and disturbance area with data from 2012 to 2015 clearance surveys.

Large Desert Tortoises	**Number of Animals Estimated On Site**	**Number of Animals Estimated to be Found[38]**	**Number of Animals Actually Found[39]**
Western Expansion Area	1,000	859	834
Southern Expansion Area	105	90	82
Small Desert Tortoises	**Number of Animals Estimated On Site**	**Number of Animals Estimated to be Found[40]**	**Number of Animals Actually Found**
Western Expansion Area	4,714	637	503
Southern Expansion Area	438	59	4

As discussed previously, we cannot parse the clearance survey data into a number of animals per high- and moderate-intensity disturbance area due to overlapping home ranges between these boundaries as well as other outside areas. The merged data from the clearance surveys indicate that the number of large desert tortoises that were found collectively in both areas does not differ significantly from the total number that was estimated to be found in both areas in the 2012 biological opinion (i.e., no difference in estimated numbers and actual numbers, per survey efficiency rates). This indicates that the analysis for this size class in the high- and moderate-intensity disturbance areas, respectively, remains valid as discussed below. For small desert tortoises, the number of animals found during clearance surveys in both disturbance areas does differ significantly from what was estimated in 2012. As discussed previously in this section, this is likely explained by the uncertainty involved in generating an accurate estimate of small desert

[38] Estimate was based on 85.9 percent survey efficacy for large desert tortoises on the ISEGS project.
[39] There is no statistical difference ($p>0.05$ at the 95 percent confidence interval) between actual survey data for large desert tortoises and the number of large desert tortoises that were estimated to be found in the 2012 biological opinion.
[40] Estimate was based on 13.5 percent survey efficacy for small desert tortoises on the ISEGS project.

tortoise population size, as well as the difficulty that biologists face in finding small desert tortoises during clearance surveys. Because of this variability, we are unable to provide data to further refine our analysis from 2012, and we anticipate that the analysis remains valid as a worst-case scenario.

As we stated for our estimates of mortality within the existing installation, we cannot attribute all the declines in the following discussion solely to military activities. To the best of our knowledge, the overall population in the expansion areas is declining in a manner similar to declines observed in other areas of the western Mojave Desert (see Status of the Species). We anticipate that military activities are likely to be the greatest source of mortality in the areas of high-intensity disturbance; other factors may influence desert tortoises more intensely in areas of moderate-intensity disturbance.

Areas of High-intensity Disturbance - Based on the size of the areas, the number of animals found during clearance surveys, the consistency between the survey data and the number of animals that were estimated to be found in 2012, and the number of animals that will be translocated, we anticipate that 39 and 4 large desert tortoises (see Table 20) would remain in the areas identified for high-intensity disturbance in the western and southern expansion areas, respectively. In contrast with the areas identified for moderate-intensity disturbance, we expect that training would further reduce the number of animals in these areas. Based on information from existing training on MCAGCC, the density of large desert tortoises is likely to decrease to between 0 to 0.8 per square kilometer (i.e., the density reported by Henen [2012] and Woodman [2001] for areas experiencing more than 700 tracks per mile/438 tracks per square kilometer) in high-intensity disturbance areas as a result of military activities. Consequently, we anticipate that the mortality of 10 to 43 large desert tortoises within areas identified for high-intensity disturbance in the expansion areas is a reasonable estimate of the worst-case scenario. This loss of individuals and the resultant density would comprise a 23 to 100 percent decline in the original post-translocation population in these areas (i.e., a decline in post-survey estimated density of 1.0 large individual per square kilometer to either 0.8 per square kilometer or zero per square kilometer). Subsequent clearance surveys would further reduce densities and mortality of desert tortoises.

We have no data on how training would affect the number of small desert tortoises, so we assume that populations of small desert tortoises would decline in proportion to the decline in large desert tortoises. Based on the size of the areas, the estimated number of animals present, the number of animals found during clearance surveys, and the likely percentage of animals translocated, we anticipate that 1,125 and 57 small desert tortoises would remain in the portions of the western and southern expansion areas, respectively, proposed for high-intensity disturbance prior to the commencement of military activities. We expect that training would likely further reduce the number of animals in these areas. If the numbers of small desert tortoises decreases between 23 and 100 percent, as predicted for the population of large individuals, this would equate to the worst-case loss of between 272 and 1,182 small desert tortoises from high-intensity disturbed portions of the expansion areas. Based on the information in the life tables that were used in this analysis, we would anticipate that the larger proportion of

this loss would be desert tortoises in the smallest size classes (i.e., hatchlings and animals with a midline carapace length less than 80 millimeters). Individuals that are larger (closer to a midline carapace length of 160 millimeters and larger) are more significant in terms of recruitment into reproductive age and size classes. We anticipate that this worst-case scenario loss of small desert tortoises would not be significant at a population level because: 1) as described previously, it is likely an overestimate; and 2) a large proportion of these smallest individuals, which constitute the majority of individuals in this estimate, would not have survived to a reproductive age in the absence of military training. As we have stated previously, we are not providing an estimate for the number of eggs that would be lost as a result of military training activities. We anticipate that the loss of eggs would not be significant at a population level because of the high rates of natural loss and mortality of eggs and smaller class sizes and the resulting low number of individuals that survive to a reproductive size.

Areas of Moderate-intensity Disturbance - For the same reasons we described in the previous section, we anticipate that 102 and 11 large desert tortoises (see Table 23) would remain in the areas identified for moderate-intensity disturbance in the western and southern expansion areas, respectively. We anticipate that the individuals remaining within these portions of the expansion areas would experience a similar magnitude of effects to those that we predict for moderate-intensity disturbance areas on the existing installation (i.e., greater than 400 tracks per mile/250 tracks per kilometer). Based on information from existing training on MCAGCC, we indicated that the density of large desert tortoises was likely to decrease to approximately 3.3 per square kilometer in areas that will experience this level of disturbance. Because the post-translocation density of large desert tortoises will be below this, and because we expect additional clearance surveys to continue to remove animals from these areas, we expect this to be an overestimate and do not anticipate that training within the moderate-intensity disturbance areas will result in a substantial decline in the number of large desert tortoises that remain following clearance surveys. However, to provide a worst-case estimate for mortality we refer back to the projected 24.6 percent mortality rate for areas of moderate-intensity disturbance on the existing MCAGCC installation. This estimate would result in a loss of between 3 and 25 large desert tortoises.

As with our estimates for the high-intensity disturbance areas, we have no data on how training would affect the number of small desert tortoises in moderate-intensity disturbance areas. Therefore, we will use the same predictions for a worst-case estimate for small animals that we did for large desert tortoises and assume that populations of small desert tortoises would decline in proportion to the decline in large desert tortoises (24.6 percent). We anticipate that 2,952 and 322 small desert tortoises would remain in the portions of the western and southern expansion area, respectively, proposed for moderate-intensity disturbance prior to the commencement of military activities. This would result in a mortality estimate of between 79 and 726 small desert tortoises in these areas. Consistent with our predictions regarding large desert tortoises and future clearance surveys and subsequent removal of additional animals, we do not anticipate that training within the moderate-intensity disturbance areas will result in a substantial decline in the number of small desert tortoises that remain following clearance surveys. Although use of the moderate-intensity disturbance areas would be infrequent and would overlap a low-density population of desert tortoises (i.e., post-translocation), we cannot rule out all likelihood of injury

and mortality because cross-country vehicle travel would still occur. We anticipate, however, that training in these areas would injure or kill relatively few desert tortoises. Table 23 summarizes our mortality estimates for high- and moderate-intensity disturbance areas within the expansion areas.

Table 23. Estimates of the number of desert tortoises likely to be killed within the expansion areas

Area	Large Desert Tortoises	Small Desert Tortoises
High-intensity Disturbance Areas	10 to 43	272 to 1,182
Moderate-intensity Disturbed Areas	3 to 25	79 to 726
Total	13 to 68	351 to 1,908

Summary - As we stated previously, equating any of these declines with mortality caused by the proposed military activities assumes a stable population in the absence of military training and assumes that the proposed military activities would be the only source of added mortality. We anticipate that the existing population is likely declining and that military activities would be the greatest source of mortality in training areas (except for large animals in moderate-intensity disturbance areas). Consequently, our quantification of the loss of desert tortoises in the training areas represents a reasonable worst-case scenario associated with the proposed military activities.

Although our estimates result from a reasonable application of the best available data, they contain numerous sources of potential error. First, estimates of the number of small desert tortoises derived by using Turner et al. (1987) likely overestimate the current number of small individuals; this overestimate affects the estimate of population size and clearance survey efficiency. Second, these estimates assume that the level of military training determines the density of desert tortoises, which ignores other sources of mortality that may influence density. Third, these estimates assume the level of disturbance anticipated in the expansion areas will affect its population to the same extent as populations on the existing installation. Fourth, our density estimates assume a stable state for populations of desert tortoises under various levels of disturbance (i.e., 0.8 adults per square kilometer is a density indicative of an area with 700 tracks per mile/438 tracks per kilometer), when they actually only reflect the density at the time the surveys were performed and ignore the potential that these populations were experiencing ongoing decline.

Military Activities in the Remaining Portions of the Existing Installation and Expansion Areas

In addition to the high- and moderate-intensity disturbance areas, mortality of desert tortoises is also likely to occur in other portions of the existing installation and expansion areas due to military activities. On the existing installation, we do not anticipate that these areas will receive an increase in military training because the Marine Corps has indicated that the new training scenarios will focus within areas identified for high- and moderate-intensity disturbance. Our biological opinion regarding the effects of the current level of military training on MCAGCC (Service 2002) addresses these areas. As we describe in the following paragraphs with regard to

future training in portions of the expansion areas that would undergo lighter use, we are unable to quantify the number of desert tortoises that are likely to be killed or injured in these areas.

Within the expansion areas, we also anticipate some level of injury and mortality in areas that are away from high- and moderate-intensity disturbance. Disturbance in these locations would be substantially less; however, because the Marine Corps would not translocate desert tortoises from these areas, more animals would be subject to the effects of the disturbance. Henen (2012e) indicated that the portions of the existing installation that experienced low (i.e., less than 100 tracks per transect) to moderate disturbance (i.e., 100 to 399 tracks per transect) supported densities between 4.9 and 6.0 adults per square kilometer. Although we cannot predict the intensity of military training in areas that are not of high- and moderate-intensity disturbance, the disturbance in these areas is unlikely to exceed that identified as low to moderate.

We developed Table 24 using data on population size in the special use areas from Karl and Henen (2011) and other data that we have previously identified in other portions of this biological opinion (i.e., size of special use areas, expansion area population size, population size in areas proposed for high- and moderate-intensity disturbance, and size of high- and moderate-intensity disturbance areas). It provides information on the number and density of desert tortoises in portions of the expansion area that are open to cross-country vehicle travel but outside of areas identified for high- and moderate-intensity disturbance.

Table 24. Desert tortoises in portions of the expansion area open to cross-country travel but outside of high- and moderate-intensity disturbance

Areas Open To Training outside of Proposed High- and Moderate-intensity Disturbance Areas	**Size (square kilometers)[41]**	**Adult Population Size[42]**	**Adult Population Density (per square kilometer)**	**Juvenile Population Size[43]**	**Juvenile Population Density (per square kilometer)**
Western Expansion Area	406.1	1640	4.0	10,975	27.0
Southern Expansion Area	60.1	169	2.8	1,131	18.8

Currently, our analysis indicates that the density of large desert tortoises in the expansion areas is below that of similar disturbance regimes on MCAGCC. Therefore, the anticipated effects within these areas are unlikely to result in substantial declines in the overall number of desert tortoises that remain following clearance surveys. Although use of these areas would be infrequent, we

[41] Size = expansion area size – (special use area size + size of high- and moderate-intensity disturbance areas)
[42] Adult Population Size = Service point estimate from Environmental Baseline – (special use area population estimate from Karl and Henen (2011) + population size of high- and moderate-intensity disturbance areas from DoN (2011a)
[43] We used the same method for calculating juvenile population size as was used for adult population size (see footnote above). However, Karl and Henen (2011) did not calculate juvenile population size in the special use areas. We estimated this by assuming that the juvenile population estimate comprised 87 percent of the total population per Turner et al. (1987).

cannot rule out all likelihood of injury and mortality of desert tortoises due to the cross-country vehicle travel that could occur. When the Marine Corps undertakes activities that would result in ground disturbance, it would move desert tortoises out of harm's way if they are located. We anticipate that relatively few desert tortoises are likely to be injured and killed. As with the analysis of effects on other portions of the existing installation and expansion area, numerous assumptions and potential sources of error exist; we have not re-stated those assumptions or caveats here. Given the variables involved, we are unable to predict how many desert tortoises are likely to be killed by cross-country vehicle travel in these areas.

Because high- and moderate-intensity disturbance areas would not be fenced to exclude desert tortoises, some potential also exists that they would act as a mortality sink; therefore, military training would continue to injure or kill desert tortoises that disperse into these areas from adjacent locations. This movement of desert tortoises into these areas could occur as the result of animals reoccupying a portion of their former home range, adult males seeking females, and juveniles dispersing from their nests. We cannot reasonably predict the number of desert tortoises that this effect could injure or kill. However, the Marine Corps has proposed to implement annual clearance surveys of higher density areas (i.e., areas with two or more desert tortoises per square kilometer as identified by previous survey), within areas of high- or moderate-intensity disturbance. As described earlier, these surveys have been enhanced since the 2012 biological opinion in order to remove more desert tortoises from high- and moderate-intensity disturbance areas and minimize the potential for injury or mortality. Consequently, we anticipate that this effect would result in the injury and mortality of few, if any, large desert tortoises.

Effects of Translocation

Effects on Desert Tortoises

The translocation of desert tortoises from the MCAGCC high- and moderate-intensity disturbance areas will be conducted to accomplish the following: 1) to remove animals from areas of disturbance in order to reduce injury or mortality; and 2) to augment locally depleted populations of desert tortoises as a strategy to improve recovery of the species. In preparation for translocation, the Marine Corps has collected 3 years of baseline information on desert tortoise density, distribution, health status, behavior, potential threats, mortality, habitat, and genetics within the recipient and control site populations and within the population to be translocated from the high- and moderate-intensity disturbance areas. The Marine Corps has used this data to refine its translocation plan and research design prior to translocating desert tortoises. Prior to the initiation of training activities, and following the Service's approval of translocation disposition plans and the Bureau's final authorization for the translocation to proceed, the Marine Corps will translocate desert tortoises from the areas identified for high- and moderate-intensity disturbance in the expansion areas to the recipient sites described in the Description of the Proposed Action section of this biological opinion.

We anticipate that the Marine Corps will capture and translocate most of the large animals, but it is unlikely to find most individuals in smaller size classes (midline carapace length less than 160 millimeters). As discussed earlier in this section, we anticipate that the clearance surveys will locate approximately 85.9 and 13.5 percent of the large and small desert tortoises, respectively, of the total number of desert tortoises estimated to inhabit the high- and moderate-intensity disturbance areas. Surveys have already been completed by the Marine Corps and have resulted in the location of 82.9 and 9.8 percent of the large and small desert tortoises, respectively, that were estimated to be found in the 2012 biological opinion. As described previously, animals large enough to be fitted with radio transmitters were transmittered and left *in situ* until their eventual capture and translocation. Animals that were too small to be fitted with transmitters were captured and moved to the TRACRS facility, where they will be cared for until they are of adequate size to be transmittered and translocated.

Based on the current number of desert tortoises that have been found within the high- and moderate-intensity disturbance areas, we anticipate the Marine Corps will translocate approximately 916 large and 507 small animals. Included in this number are 285 desert tortoises that were too small to be transmittered during surveys and were thus moved to the TRACRS facility as described above. As stated previously, the Marine Corps predicts to find up to an additional 82 large and 40 small desert tortoises within these areas using survey efficiency estimates (Karl 2002). The Marine Corps' movement of the southern staging area to a location with lower desert tortoise density was intended to reduce the number of animals affected by military training. This measure was implemented at the beginning of the 3-year pre-translocation research, and the number of desert tortoises found to date is representative of the move to this staging area. Approximately 80-85 desert tortoises have been located in this new area; the degree to which this measure reduced the number of animals that will be translocated is unknown.

These numbers provide an estimate of the number of animals that the Marine Corps will translocate. We cannot precisely quantify the total number of desert tortoises it will translocate because the Marine Corps will conduct annual clearance surveys of higher density areas that should locate additional desert tortoises that may have been missed during clearance surveys, as well as animals that may move into the high- or moderate-intensity disturbance areas from adjacent habitat after clearance surveys have been completed.

The Marine Corps has proposed to investigate whether areas can support higher population densities than what currently exist in the respective recipient sites, with a goal of augmenting depleted populations to achieve and maintain minimum viable density levels. The latest Service translocation guidance (Service 2016b) defines a depleted population as an area where desert tortoise density has decreased to below a minimally viable level of 3.9 adult desert tortoises per square kilometer. This guidance also recommends a maximum increase in post-translocation density of one standard deviation above the existing mean density. To evaluate the effects of density increases in existing populations, the Marine Corps will translocate desert tortoises to depleted areas to achieve post-translocation density classes of 5.5, 8.1, and 10.4 large desert tortoises per square kilometer in respective sites, augmenting these populations to levels above the minimum viability threshold. These densities are all within historic levels based on the

survey data available (see the Status of the Desert Tortoise section in this biological opinion). This will result in increases in standard deviation from the existing mean densities of between 0.7 and 2.6. The release and dispersal areas of the Lucerne-Ord recipient site, as well as portions of the dispersal area of the Rodman-Sunshine Peak North recipient site, occur mostly in the Ord-Rodman ACEC and may help to augment the population. As we have described previously, the population density in the ACEC as a whole has declined to approximately 3.6 large desert tortoises per square kilometer, and we anticipate that population augmentation here will have beneficial effects on the existing population.

The Marine Corps will transport desert tortoises from the expansion areas to recipient sites using helicopters, which are intended to reduce stress levels in animals as they are being moved to the recipient site release areas. Helicopters provide shorter transportation times as well as less physical jarring versus being driven to the sites on existing paved and unpaved roads. The Marine Corps will identify landing sites on existing roads, preferably intersections, in the recipient sites, and will conduct surveys before landing to ensure no desert tortoises are present within 30 meters of a landing zone. Because the Marine Corps will use experienced biologists approved by the Service and approved techniques, and because surveys will be conducted to ensure no desert tortoises on the ground are affected by the landing of helicopters, we do not anticipate that translocated or resident animals are likely to be injured or killed during the translocation process.

The translocation and post-translocation monitoring program would involve periodic handling, blood sample collection, physical marking for later identification, attachment and replacement of transmitters, and movement of large numbers of desert tortoises over a 30-year period. Based on the frequency of post-translocation monitoring described in the translocation plan (MCAGCC 2016b), the Marine Corps is likely to capture and perform these activities on most animals numerous times over the course of the monitoring period, with the number of animals subjected to these activities decreasing over time. Capturing and handling desert tortoises and performing blood sample collection and transmitter attachment may cause elevated levels of stress that render them more susceptible to disease or dehydration from loss of fluids.

Following translocation, the Marine Corps will monitor 20 percent of the translocated large desert tortoise population (i.e., 190 individuals), 5 percent of the translocated small desert tortoise population (i.e., 35 individuals), and an equal number of animals in each size class that are residents in the recipient sites (i.e., 225 total individuals) and paired control sites (i.e., 225 total individuals). The Marine Corps will monitor this total sample of 675 animals for 5 years using radio tracking, periodic health assessments, blood sample collection, and collection of other data. After 5 years of radio tracking, the transmittered group of desert tortoises will be decreased to 50 individuals per group (translocated, resident, and control: 150 individuals total) and monitored via radio tracking for five additional years on a reduced monitoring schedule. At the end of this 5-year period, transmitters will be removed from all desert tortoises unless the Marine Corps and resource management agencies determine that additional monitoring is necessary.

The Marine Corps will also conduct mark-recapture surveys on desert tortoises on 10 to 12 one-square kilometer plots in the recipient and control sites every 5 years for 30 years. Based on the overall density of the Ord-Rodman ACEC (3.6 desert tortoises per square kilometer), where most plots would be located, the number of desert tortoises monitored on study plots could be approximately 36 to 43 large animals. However, the final location and the site-specific density of the plots could result in some variation from this estimate. Because the Marine Corps will use experienced biologists approved by the Service and approved techniques, we do not anticipate that these animals are likely to be injured or killed because of improper handling.

Post-translocation Movement - Previous studies have documented numerous effects to desert tortoises that could occur following translocation. Translocation studies have shown that straight-line movement distances following release can be over 3.73 miles in the first year for some desert tortoises (Berry 1986, Field et al. 2007, Nussear 2004). Mean dispersal distances observed on three study plots south of Fort Irwin ranged from 0.09 to 3.5 miles, with maximum dispersal distances of between 7.8 to 14.3 miles (Walde et al. 2008). In another study, translocated desert tortoises were found to move more than 1.5 times more than control animals, with some moving as far as ten kilometers from the translocation site (Hinderle et al. 2015). For short-distance translocations, data seem to indicate shorter post-translocation dispersal distances (0.5 to 0.9 miles) (Walde et al. 2008).

Some translocation studies have found that translocated animals seem to reduce movement distances following their first post-translocation brumation to a level that is not substantially different from resident populations (Nussear 2004, Field et al. 2007). As time increases from the date of translocation, most desert tortoises change their movement patterns from dispersed, random patterns to more constrained patterns, which suggest an adoption of a new home range (Nussear 2004). By the second to third year following translocation, desert tortoises show increasing site fidelity and movement more similar to resident animals (Nussear et al. 2012). However, translocation studies at Fort Irwin have found that desert tortoises that were released a substantial distance from their capture site moved greater distances than both resident and control groups over a 3-year period, but animals released a short distance from their capture site had similar movement patterns to those of resident and control groups (Averill-Murray 2011). This may indicate that some translocations result in translocated animals taking longer to settle into new home ranges after release, but the distance that the animals are moved from their capture site likely influences this result. For the proposed translocation, the Marine Corps intends to move desert tortoises no further than 40 kilometers from their point of capture to respective release areas, per Service draft translocation guidance (Service 2016b). For context, desert tortoises translocated at Fort Irwin were moved between 0.5 and 50 kilometers (Averill-Murray 2016). We anticipate that some desert tortoises, particularly those moved the furthest away from their point of capture, will move large distances that correspond to the information presented.

Translocated desert tortoises can also substantially expand the area they occupy in the first year following translocation (e.g., from 3.9 to 6.9 square miles at a Nevada site; from 0.2 to 10.3 square miles at a Utah site). During the first year post-translocation, home range size of translocated desert tortoises may be larger than residents (Farnsworth 2015). The degree to

which these animals expand the area they use may depend on whether the translocated animals are released into typical or atypical habitat; that is, if the recipient site supports habitat that is similar to that of the source area, desert tortoises are likely to move less (Nussear 2004). Habitat in the release area may be particularly important to translocated small tortoises, with certain attributes of refugia such as rodent burrows, substrate texture (prevalence and size of rocks), and the presence of washes resulting in reduced dispersal distances and decreased overall mortality (Nafus et al. 2016).

We cannot predict the direction that translocated animals are likely to move. In some instances, translocated desert tortoises have exhibited a tendency to orient toward the location of their capture and attempt to move in that direction (Berry 1986), but in other instances, no discernible homing tendency has been observed in translocated animals (Field et al. 2007). Information specific to short-distance translocations indicates that at least some individuals will attempt to return to their former home ranges after release (Rakestraw 1997, Stitt et al. 2003). One study found that 44 percent of desert tortoises translocated less than two kilometers were able to home successfully and return to their source location, while animals moved eight kilometers or more did not demonstrate a homing tendency and did not return (Hinderle et al 2015).

We anticipate that increased post-translocation movement is likely to place desert tortoises at an elevated risk of injury or mortality due to increased exposure to mortality factors while animals are establishing new home ranges. Studies have documented various sources of injury and mortality for translocated individuals, including predation, exposure, fire, disease, crushing by cattle, and flooding (Nussear 2004, Field et al. 2007, Berry 1986, U.S. Army 2009, 2010). More recently, Brand et al. (2016) found that while desert tortoises translocated short distances experienced elevated thermal effects (e.g., elevated maximum daily temperature and duration spent above 35 degrees Celsius) during the first 4 months post-translocation, over time there was no difference in these effects as compared with resident and control animals. Desert tortoises in this study did not differ from resident or control animals in body condition, growth, or mortality, indicating relatively minor overall effects from translocation.

Based on this information, we anticipate that some of the translocated desert tortoises will move substantial distances after their release. The Marine Corps has identified release areas within each recipient site that offer suitable habitat for desert tortoises after they are translocated. Ensuring that desert tortoises are moved only into suitable habitat is likely to reduce post-translocation movement to some extent. It is also possible that translocated desert tortoises moved from areas closer to their respective recipient areas may exhibit homing behavior and orient their movement towards training lands. Animals released into fenced areas as part of the constrained dispersal study would not move long distances because of their confinement, which would continue for 2 years following translocation until the fencing is removed and animals are allowed to disperse away from the site if desired.

There is some potential for desert tortoises to be killed on roads during the period when translocated individuals are moving more and establishing new home ranges, as well as in general throughout the life of the translocation program. The Marine Corps has implemented

measures to address this risk and minimize the potential for injury and mortality on roads. These include: 1) the recipient site selection criteria that release areas be at least 6.5 kilometers from major unfenced roads or highways; 2) speed limits and driver awareness training for personnel within in the MCAGCC installation and the recipient sites; and 3) the translocation of some desert tortoises to the constrained recipient site, inside which there are no roads. We are unable to quantify the reduction in risk these measures will provide, but we do anticipate that they will lessen the risk of vehicular strike to desert tortoises to some degree.

The Marine Corps has proposed to install desert tortoise exclusion fencing along the boundary between the Siberia recipient site and current training areas in the northern portion of MCAGCC. We anticipate that this exclusion fencing will prevent desert tortoises from re-entering training areas and would be effective in reducing mortality of both translocated and resident desert tortoises. However, when desert tortoises encounter exclusion fencing, they often exhibit fence-pacing behavior that can increase their exposure to predators and thermal extremes. In order to mitigate this, the Marine Corps will monitor new fences after they are installed to reduce the likelihood that desert tortoises would be killed if pacing behavior occurs.

Predation - As with other translocations (Nussear 2004, Field et al. 2007, U.S. Army 2009, 2010), we anticipate that predation by canids is likely to be the primary source of post-translocation mortality for a number of reasons. Study of translocated desert tortoises at Fort Irwin has documented a statistically significant relationship between drought conditions and increased predation due to prey-switching by canids (see Averill-Murray 2010). Drake et al. (2011) noted that "[d]rought can also indirectly increase mortality through increased predation on adult [desert] tortoises as the result of a functional response (prey switching) of predators to a decrease in prey availability." As described previously the translocation will occur during a time in which the western Mojave Desert has been experiencing multi-year drought conditions. The level of winter rainfall in particular may dictate rates of predation observed in desert tortoise populations (Drake et al. 2010).

Proximity to human population and subsidized predators has also been shown to lead to higher than normal rates of predation on desert tortoises (Esque et al. 2010). Translocated desert tortoises tend to exhibit lesser space-use intensity as they establish new home ranges, and the greater space-use intensity of resident and control animals has been correlated with more time spent in burrows where animals are better protected against predators (Farnsworth 2015). It is possible that translocated desert tortoises will be at greater risk for predation immediately following translocation due to the general tendency for translocated animals to spend more time above ground than residents or controls (Hinderle 2012). For the above reasons we anticipate that during the first post-translocation active season, mortality rates for translocated desert tortoises due to exposure or predation could be higher than those for resident and control animals. From the second post-translocation active season onward, we do not anticipate that mortality rates for translocated desert tortoises will statistically differ from the resident and control populations. We expect small desert tortoises to be at a heightened risk of predation due to their size, but acknowledge that all size classes may be affected at varying magnitudes depending on localized factors.

To reduce the effects of predation on all desert tortoise populations, the Marine Corps will implement a predator management plan (see Minimization Measures in the Project Description of this biological opinion) that includes the removal of offending canid predators based on the following thresholds as trigger points: 1) if canid predation in a recipient site exceeds that observed in the associated control site; 2) if canid predation of translocated desert tortoises in a recipient site exceeds that of the associated resident or control population; 3) if canid predation exceeds 10 percent of desert tortoises in a recipient site within a 1-year time frame; 4) if canid predation exceeds 3 percent of desert tortoises in a recipient site within a 30-day time frame. Predator use of recipient and control sites, and predation events on desert tortoises, will be regularly documented within the three sample desert tortoise populations being monitored post-translocation. This monitoring will be supplemented by Conservation Law Enforcement Officer (CLEO) patrols in the recipient and control sites.

Removal of offending canid predators will be accomplished by hunting in Bureau-managed lands through an on-base hunter education program, and by CLEOs during patrols. This hunting program is designed to enable a rapid response by the Marine Corps to remove offending predators from respective areas. The intent of this measure is to monitor and manage predation rates over long-term time frames, and to identify and manage predation events that occur in the short term. The Marine Corps will notify the Service when predator removal trigger points have been reached, and will coordinate with the Service to adaptively manage predator management over the life of the translocation program. We anticipate that with implementation of this program, and with special emphasis placed on monitoring and management during the first year post-translocation, predation rates of translocated desert tortoises will not differ from those of resident or control populations.

Increased Population Density - Translocating desert tortoises may also affect resident desert tortoises within the recipient sites due to increases in local population density. Higher densities in recipient sites may lead to increased incidences of aggressive interactions between individuals, as well as opportunistic predation that may not have occurred in the absence of translocation. The spread of pathogens that cause disease (e.g., those that cause upper respiratory tract disease) is of particular concern and can occur via two pathways during translocation. Translocated animals that are infected with disease can introduce pathogens into otherwise healthy local populations, and disease prevalence can increase in a broader area due to increased density and more frequent interactions between individual animals. Stress associated with handling and movement or due to density-dependent effects could exacerbate this threat if translocated individuals with subclinical upper respiratory tract disease or other diseases begin to exhibit clinical signs of disease due to the stress associated with handling and movement. The Marine Corps will implement visual health assessments prior to translocation, and has collected disease data for animals that have been transmittered during the 3 years of pre-translocation research. We anticipate that this will prevent infected animals from being translocated and will reduce the risk of introducing new disease into the recipient sites.

Physiological Stress - Information from the Fort Irwin translocation project indicates that translocations in that study did not result in a measurable physiological stress response (Averill-

Murray 2011, Drake et al 2012). Because the Marine Corps will use qualified biologists and approved techniques to perform translocation tasks, we do not anticipate that these animals would experience increased stress during handling.

Disease - The Marine Corps has collected disease data for desert tortoises that will be translocated from high- and moderate-intensity disturbance areas, as well as for animals within the recipient and control sites. There are no indications of disease outbreak in any of these populations. The Marine Corps will continue to perform health assessments on a subset of desert tortoises in the translocated, resident, and control populations to evaluate disease prevalence over time. Analysis will be performed using enzyme-linked immunosorbent assay (ELISA) and quantitative polymerase chain reaction (qPCR) techniques. The qPCR method is particularly useful for its high level of detection of *Mycoplasma* species as well as its ability to test for the presence of tortoise herpesvirus-2 (THV-2). Like *Mycoplasma agassizii* and *Mycoplasma testudineum*, THV-2 is a causative agent of upper respiratory tract disease in desert tortoises. Its presence in wild populations has not been thoroughly studied, and this translocation presents an opportunity to learn more about its prevalence. Finally, the Marine Corps will conduct visual health assessments just prior to translocating desert tortoises, will not translocate any animals showing clinical signs of disease, and will only release individuals following review and approval of previous test results by the Service. For these reasons, we do not anticipate that translocation will result in an increase in disease prevalence among the translocated or resident populations in the recipient sites.

Habitat Quality - Habitat quality is believed to be a key component to the successful translocation of desert tortoises, and was a primary consideration in the selection of recipient sites for this translocation. The two largest recipient sites, Lucerne-Ord and Rodman-Sunshine Peak North, consist of mostly refugia (currently suitable habitat that may continue to be suitable given future climate change scenarios) or areas that may provide new habitat given future climate change scenarios (see Barrows et al. 2016). The Cleghorn Lakes constrained recipient site consists of suitable habitat and is surrounded by additional suitable habitat that can be used by desert tortoises following removal of fencing. The other recipient sites, Broadwell and Siberia, collectively provide approximately 67 percent of the amount of quality habitat as the Lucerne-Ord and Rodman-Sunshine Peak North sites are composed of, with Siberia composed of approximately 44 percent suitable habitat (MCAGCC 2016b). These sites will receive comparatively fewer translocated desert tortoises than the Lucerne-Ord and Rodman-Sunshine Peak North sites. Given the above information, we do not anticipate that survivorship of translocated desert tortoises over time will statistically differ from the resident and control populations.

Reproduction - Translocation may also have effects on reproductive output and assimilation of desert tortoises. Data from the Fort Irwin translocation suggests that resident and control desert tortoises may produce more first and second clutches across multiple years than translocated animals (Averill-Murray 2010). In contrast, Nussear et al. (2012) found that mean reproductive output for translocated adult female desert tortoises was slightly less than for resident animals during the first year post-translocation, but during the second and third year no difference was

detected, suggesting only short-term effects. This study did note that the translocated animals were held in a husbandry facility prior to translocation, and that the provision of food prior to translocation may have increased egg production in the first year. This could have ameliorated some of the early effects on reproductive output. Data from the Fort Irwin translocation also suggested that adult males were not assimilating into the reproductive population, as no genetic evidence of offspring was detected 4 years after translocation (Walde and Boarman 2013). This data encompasses a narrow time frame in the reproductive period of a desert tortoise's lifespan, and overall we anticipate that reproductive effects on translocated desert tortoises would subside over time.

Constrained Dispersal - The Marine Corps has proposed to conduct research on constrained dispersal that will involve the enclosure of translocated and resident desert tortoises in the Cleghorn recipient site for a 2-year period following translocation. Saethre et al. (2003) evaluated the effects of density on desert tortoises in nine semi-natural enclosures at the Desert Tortoise Conservation Center in Nevada. The enclosures housed from approximately 289 to 2,890 desert tortoises per square mile. Saethre et al. (2003) observed a greater incidence of fighting during the first year of the experiment but did not detect any trends in body condition index, reproduction, or presence of the symptoms of upper respiratory tract disease among the enclosures. Body condition index and reproduction are important indicators of how translocation may affect resident desert tortoises; generally, stress suppresses body condition index and reproduction in desert tortoises. This study did not draw any conclusions regarding density-dependent effects on predation of desert tortoises.

Because the stocking rates proposed by the Marine Corps will result in densities far lower than those at which Saethre et al. (2003) observed adverse effects, we do not anticipate similar effects to desert tortoises in the Cleghorn enclosure. We do anticipate that installation of exclusion fences to constrain the enclosure will result in similar effects as those discussed previously for exclusion fence installation in the Siberia recipient site (e.g., fence pacing). The Marine Corps will mitigate this by monitoring the Cleghorn population to reduce the likelihood that desert tortoises would be killed if pacing behavior occurs. We anticipate that the constrained nature of the Cleghorn recipient site will restrict post-translocation movement by desert tortoises to levels below that observed in unrestricted recipient sites. This would effectively lower the risk of injury or mortality due to the factors that we earlier discussed that relate to post-translocation movement and increased time spent above ground by translocated desert tortoises.

Predation events involving desert tortoises in constrained sites have been documented, as recently evidenced by the ISEGS project following the release of small desert tortoises from a headstart facility into a constrained recipient enclosure (Weise 2016). During this event, 14 small (all less than 160 millimeters) desert tortoises were reported predated by one or more canids during a 30-day time frame shortly following translocation. The majority of carcasses were discovered along the inner fenceline of the enclosure, indicating that predators were trapping small desert tortoises against the fenceline. We expect small desert tortoises to be at a heightened risk of predation due to their size, but acknowledge that all size classes may be affected at varying magnitudes depending on localized factors. To reduce the risk of predation within the

Cleghorn enclosure, the Marine Corps will implement its predator monitoring and control plan as described above, but with the added measure of focused CLEO monitoring of the site during the first month following translocation, with additional focused patrols conducted as possible during the 2-year period when the site will be fully enclosed. We expect that the rapid response enabled by the predator management plan and focused CLEO patrols will reduce the likelihood of injury or mortality to desert tortoises within the enclosure. For these reasons, and because the Cleghorn site is considered to have generally good quality habitat, we do not anticipate that mortality for translocated desert tortoises at any time will statistically differ from the resident and control populations.

Grazing - Cattle and sheep grazing can have direct and indirect effects on desert tortoises and their habitat. Grazing can result in a dramatic decrease in aboveground biomass of native annuals and shrubs (Fleischner 1994; Brooks et al. 2006), which desert tortoises rely heavily on for food and shelter. Other effects include weakened resistance to invasive plants and weed infestation, loss of biological soil crust due to trampling, and increased bare ground (Reisner et al. 2013). In areas where invasive or non-native plants have displaced native annuals and other plants that desert tortoises normally forage upon, there may be the potential for lack of proper nutrition to lower reproductive output in females. We have no data to support this hypothesis, but since there are many factors that influence egg production we present the issue of reduced nutritive value of invasive and non-native plants as a potential risk. Portions of the Lucerne-Ord recipient site overlap with the Ord Mountain grazing allotment, where grazing densities have historically been low (i.e., 25-30 head of cattle; Chavez 2016). The Marine Corps will evaluate the effects that historic and current cattle grazing has on desert tortoise survivorship, assimilation, density, habitat quality, and other factors. Information on historical grazing practices, desert tortoise density, and habitat quality will be considered in this analysis. As described in the Environmental Baseline section of this biological opinion, the Lucerne-Ord site is considered to have good quality desert tortoise habitat and consists largely of areas modeled to be refugia and future habitat for desert tortoises. For these reasons, and because of historical and current low stocking rates and presumed effects due to grazing, we do not anticipate that mortality for translocated desert tortoises in grazed areas will statistically differ from the resident and control populations.

Climate - We discussed the broader and more general effects of projected climate change to desert tortoise habitat and conservation in the Status of the Species section of this biological opinion. The aspects of climate phenomena that relate to our analysis of the proposed action here include: 1) the prolonged multi-year drought in the western Mojave Desert, which could include the reduction in winter precipitation of up to 20 percent; and 2) an increase in temperature, particularly in the summer months, of up to 3.5 to 4.0 degrees Celsius. Based on the premise that all desert tortoises, irrespective of translocated, resident, or control group status, experience the effects of drought at approximately the same levels (Field et al. 2007), and because animals in the expansion areas have experienced the same effects from drought as animals in the recipient areas have in recent years, we do not expect that these conditions would decrease the survival rate of translocated desert tortoises. We do again note that drought conditions can indirectly increase mortality by increasing predation as a result of prey-switching, which the Marine Corps will manage through implementation of its predator monitoring and control plan. Also, as

discussed in the Existing Conditions in the Action Area section of this biological opinion, the amount of winter precipitation in late 2016 and early 2017 has been above normal, and if this continues we would expect that conditions in the recipient sites would be correspondingly more suitable for translocation to occur in Spring 2017. We do emphasize, however, that this is a short-term weather pattern and that we consider multi-year drought conditions in the western Mojave Desert to still exist.

Barrows et al. (2016) modeled approximately 2,840 square kilometers of desert tortoise habitat within and adjacent to the MCAGCC installation and predicted that up to 55 percent of this habitat could be lost due to projected increasing summer temperatures (i.e., with a three degree Celsius increase in summer temperature by the end of this century). This model also identified approximately 1,157.9 square kilometers of current habitat that would overlap with suitable habitat given the experimental three degree Celsius shift; this portion of the modeled area would provide refugia for desert tortoises given this climate change scenario. There are implications associated with extended drought conditions in the western Mojave Desert that could affect the proposed translocation of desert tortoises, including decreased survivorship, depressed reproductive output by female desert tortoises, and habitat loss (see Longshore et al. 2003, Henen 2002, Jennings and Berry 2015, among others). We are largely unable to determine what the effects of extended drought conditions and climate change will be on translocated desert tortoises, but at least three of the recipient sites (Lucerne-Ord, Rodman-Sunshine Peak, and Siberia) overlap largely with areas identified as potential refugia by the Barrows et al. model. While this model is coarse in nature, it does represent the best available information we have to analyze the effects of increased temperature and shifting precipitation patterns on desert tortoises that would be translocated. We anticipate that these areas will be beneficial to translocated (and resident) desert tortoises over a long-term time frame.

Headstarting - The Marine Corps has established the Tortoise Research and Captive Rearing Site (TRACRS) headstarting facility, to be used throughout the life of the translocation program to hold small desert tortoises found during subsequent clearance surveys that are too small to be translocated. Once of adequate size to be transmittered (approximately 120 millimeters) these animals would be translocated per Service guidelines. Large animals captured during clearance surveys during times of the year when translocation cannot proceed will also be held in the TRACRS facility until translocation can occur per Service guidelines. During captivity, the Marine Corps will monitor the survivorship, movement, behavior, burrow use, growth, and general health of these animals. There are currently 285 small desert tortoises being cared for at TRACRS.

Previous studies have documented mortality at long-term desert tortoise quarantine and head-start facilities (Nagy 2010, Hillard et al. 2006). These studies have noted specific problems related to predation of small desert tortoises by ground squirrels (*Spermophilus* spp.) and fire ants (*Solenopsis xyloni*), and potential predation by roadrunners (*Geococcyx cailfornianus*) and burrowing owls (*Athene cunicularia*). Based on 5 years of data on desert tortoise survivorship at the Marine Corps' head-start facility, Nagy (2010) reported that up to 80 percent of hatchlings survived their first year of life and yearly survivorship for individuals larger than hatchlings was

up to 90 percent. Survivorship at the TRACRS facility since this period has been 85-96 percent for small animals being headstarted, and up to 99 percent for large animals being held in quarantine. We expect that survivorship of desert tortoises at the TRACRS facility is substantially higher than what individuals in respective size classes would experience in the wild. We anticipate that large animals in particular would have lower susceptibility to mortality factors associated with captivity and would likely experience little, if any, mortality while being held at TRACRS. For these reasons, we anticipate that the TRACRS headstarting facility would increase the survivorship of desert tortoises in all size classes that are affected by translocation and would offset mortality of individuals related to other aspects of the proposed action.

Quantification of Survivorship - Although we have qualitatively analyzed translocation effects, quantitative assessment of the magnitude of each effect is difficult for the following reasons. First, we cannot precisely quantify the number of desert tortoises that the Marine Corps would ultimately translocate. Second, we cannot quantify the degree to which protective measures will reduce adverse effects. Third, we cannot predict the amount of time it will take for desert tortoises to settle into new home ranges, where they would be relatively safer from mortality sources. Fourth, we cannot predict the degree to which predation will affect respective recipient and control sites. Finally, we cannot predict the degree to which drought will influence survivorship through a number of mechanisms, including physiological stress, reduced reproductive fitness, increased predation, and increased disease transmission. Although we cannot provide a precise estimate of the level of injury and mortality for the proposed translocation, we have attempted to provide a rough characterization of its magnitude below.

From previous studies, the observed levels of mortality in translocated desert tortoises have ranged from 0 to 24.9 percent (Field et al. 2007, Cook et al. 1978 in Nussear 2004, Esque et al. 2010). None of these studies compared mortality rates in resident and translocated populations to the mortality rate in populations not affected by translocation (i.e., controls); therefore, we cannot determine whether translocation or other factors caused these mortalities. Drake et al. (2011) found that mortality rates among translocated, resident, and control animals in Fort Irwin's southern translocation area ranged from 34 percent in 2009 to 1.5 percent in 2011. Nussear (2004) found that mortality among translocated animals was not statistically different from mortality observed in resident populations. Esque et al. (2010) found that mortality in resident (29 of 140 desert tortoises; 20.7 percent mortality), control (28 of 149; 18.8 percent), and translocated (89 of 357; 24.9 percent) animals did not differ statistically and concluded that the translocation was not the cause of the observed mortality. Nussear et al. (2012) found no difference between translocated desert tortoises and residents or controls in survivorship across five sites in Utah and Nevada. More recently, Scherer et al. (2016) reported a 14.8 percent mortality rate among large desert tortoises (those with midline carapace length great than 160 millimeters). Drake et al. (2011) also noted other studies that demonstrate variable mortality rates in consecutive years.

More recent analyses generally support these findings and have continued to indicate no significant difference in survival probability for translocated desert tortoises versus resident or control groups. For example, Scherer et al. (2016) and Brand et al. (2016) report that survival

probability for translocated desert tortoises across all size classes at the ISEGS facility have not differed statistically from resident or control groups over the 4 year post-translocation period. The Scherer et al. (2016) study did find a relationship between survival probability and midline carapace length, with survivorship increasing correspondingly with increasing size. The Moapa Southern Paiute Solar (formerly KRoad Moapa) project in southern Nevada reported a large desert tortoise (midline carapace length equal to or greater than 160 millimeters) mortality rate of 28.0 percent after more than 3 years of post-translocation monitoring (Martin 2016). Mortality rates for small desert tortoises at Moapa were 66.7 percent, and the majority of these were confirmed to result from predation. These data, as well as the ISEGS data regarding the recent mortality of small desert tortoises in a constrained enclosure (see previous discussion on predation) emphasize the vulnerability of small desert tortoises to mortality, particularly due to predation. All of the studies identified above cover short-term time frames, and we do not have information on longer-term effects of translocation at this time. Consequently, we cannot estimate the level of post-translocation mortality in the three groups because of extraneous factors that we cannot control or predict (e.g., drought, predation, background trajectory of decline, etc.). However, based on the studies noted above, and considering the expected effectiveness of the Marine Corps' predator monitoring and control plan, we anticipate that post-translocation mortality will not be statistically different for translocated desert tortoises in any recipient site than for the respective resident or control populations.

Consequently, based on the number of desert tortoises that have already been found as well as the number we expect the Marine Corps to find during subsequent clearance surveys (998 large and 547 small desert tortoises), and considering mortality rates from the previously cited studies (14.8 percent to 34 percent), we anticipate the mortality of between 148 and 339 large desert tortoises from the collective recipient sites. We do not expect this loss to be significant to the translocated or resident populations, because: 1) the translocation will remove desert tortoises from areas where high- and moderate-intensity disturbance will occur, which we believe would result in significantly higher mortality; 2) the translocation will augment depleted populations, bringing them to levels above the minimum viable density threshold; 3) we anticipate that translocated desert tortoises will disperse throughout their respective recipient sites, which will expand the local and broader distribution of animals; and 4) we anticipate that large translocated desert tortoises will assimilate into resident populations, contributing to long-term population viability via additional reproduction and recruitment. We expect mortality rates for small desert tortoises to occur at higher rates, potentially approaching 67 percent, which would result in a loss of 367 animals. Again using information from the life tables that were used in our previous analysis on the effects of military training, and based on the positive relationship between midline carapace length and survivorship that was noted from the ISEGS data (Scherer et al. 2016), we anticipate that the smaller animals in this cohort would be the most vulnerable to mortality factors. We anticipate that the loss of small desert tortoises would not be significant at a population level because: 1) many of these animals would be lost in the absence of translocation due to other background mortality factors; and 2) the augmentation of large desert tortoises into resident populations, and the beneficial effects we expect this to have on assimilation, reproduction, and recruitment, will offset this loss of small desert tortoises.

Considering data from the studies we have cited, we anticipate that a similar proportion of the recipient and control populations will be lost over the same relative time frames. We do not anticipate that mortality will be the direct result of translocation. As previously noted, past studies indicate that predation, and in particular increased predation rates influenced by drought and prey-switching, may be a significant source of mortality in the broader region, although individuals will also likely die from other causes. We have no information with which to predict the long-term population-level effects of this translocation. We acknowledge that other factors may affect mortality rates in the region; in such cases, we expect that mortality rates may vary widely between years and the key measure of the effects of translocation will be the comparison of the rates of mortality among translocated, resident, and control animals.

Effects of Reduced Densities and Population Fragmentation on Population Viability

In previous sections, we discussed habitat loss and several sources of injury and mortality of desert tortoises that are associated with military activities. We anticipate that the predicted level of habitat loss and mortality will reduce desert tortoise densities and fragment desert tortoise populations to some degree. Extensive habitat loss or installation of impermeable barriers to movement can reduce population connectivity, which can reduce or eliminate the exchange of genetic information or place populations at risk from demographic imbalances. If isolated populations are small or have a low density, long-term population viability is unlikely.

The Service (1994) recommended a viable population density threshold of 3.9 desert tortoises per square kilometer based on the premise that male and female desert tortoises were less likely to locate one another and reproduce below this density. The maintenance of evolutionary potential requires a population of at least 5,000 adult individuals to maintain sufficient genetic diversity for long-term genetic potential and a density of at least 3.9 desert tortoises per square kilometer is needed to protect against genetic deterioration and demographic stochasticity (Service 1994). To protect against demographic consequences of small population size and buffer population size so the population persists, population size must be at least 10,000 adult animals (Service 1994). A population that has a high density (i.e., well above 3.9 adults per square kilometer) and is relatively stable requires less contiguous area because individuals are able to find one another to mate; such a population is more likely to maintain the minimum size necessary for long-term viability. Low-density populations require more contiguous area to meet the minimum viable population size. Loss of individuals from a low-density population in a smaller area that is not connected to other blocks of occupied habitat could mean that it drops below the threshold density necessary to ensure mating and reproduction. This would result in loss of population viability due to the effects of genetic deterioration and demographic stochasticity.

The Marine Corps did not provide information on the percentage of the existing installation that is at or below the minimum density threshold, but we know that the density in the high- and medium-intensity disturbance areas, following clearance surveys to date, is approximately 4.5 large desert tortoises per square kilometer (prior to translocation). We also know that 71 percent of the installation, primarily in areas used for training, had densities of between 0 and 7.7 per

square kilometer based on surveys from the late 1990s (DoN 2011a). We do not know what portion of MCAGCC currently contains desert tortoises at a density of less than 3.9 per square kilometer, but Henen (2012e) showed that areas with more than 400 vehicle tracks per transect (i.e., moderately to heavily disturbed) contained approximately 3.3 adults per square kilometer; this density decreased as the density of tracks increased. While desert tortoise densities in the high- and moderate-intensity disturbance areas that were surveyed during clearance surveys had an overall density of approximately 4.5 individuals per square kilometer, it is estimated that approximately 52 percent of the western expansion area contains densities of less than 3.9 desert tortoises per square kilometer (DoN 2011a). Approximately 20 percent of the southern expansion area contains densities below 3.9 desert tortoises per square kilometer.

We have provided extensive information in the Environmental Baseline section to show that desert tortoises occur throughout MCAGCC and the expansion areas. In addition, desert tortoises occur adjacent to these areas (Bureau et al. 2005). Habitat potential across MCAGCC, the expansion areas, and into adjacent areas like the Ord-Rodman ACEC indicate a large contiguous block of desert tortoise habitat that connects low-density portions of MCAGCC and the expansion areas to other areas containing desert tortoises (Nussear et al. 2009). However, recent data from line distance sampling (Service 2015b) has estimated dramatic declines across critical habitat units in the Western Mojave Recovery Unit, as well as in critical habitat units throughout much of the range of the desert tortoise. Within the Western Mojave Recovery Unit, densities have declined to approximately 2.6 individuals per square kilometer in the Fremont-Kramer critical habitat unit, approximately 2.4 individuals per square kilometer in the Superior-Cronese critical habitat unit, and as previously stated approximately 3.6 individuals per square kilometer in the Ord-Rodman critical habitat unit. These densities all lie below the minimum viable density threshold for persistent populations. While mortality resulting from the proposed action is a substantial loss in terms of numbers, we do not anticipate that it represents an appreciable acceleration in the decline that we consider to be ongoing in the recovery unit.

The potential exists that habitat loss associated with military activities could result in isolation or near isolation of desert tortoises in some portions of the expanded installation. Large expanses of denuded habitat that separate a low density of desert tortoises from those in adjacent areas could reduce connectivity and create isolated or near-isolated groups of animals that are below the minimum density and number of animals necessary to maintain population viability. As we have indicated, denuded areas associated with high-intensity disturbance (e.g., MEB objective) may lose desert tortoises completely, but these areas occupy relatively small discrete locations that would not isolate populations. However, loss of population viability in these instances would result in eventual loss of desert tortoises from localized areas within the expanded installation

On a regional scale, loss of population connectivity can affect the viability of populations in areas that we have identified as important to the recovery of the species (e.g., ACECs, national parks, etc.). Ensuring connectivity between these areas is important to allow for climate change adaptation, to provide sufficient area for viable populations, and for the maintenance of gene flow across the range (Service 2012b). Military training in the MCAGCC installation and the western expansion area would affect a linkage that connects the southwestern portion of the Ord-

Rodman ACEC to the northern end of Joshua Tree National Park and into the Pinto Mountains critical habitat unit. On its southern end, this linkage includes the developed residential areas of Yucca Valley and Joshua Tree, California. This linkage also includes areas occupied by the western portion of the existing installation and the western expansion area. Despite residential disturbance and despite the historic management of the western expansion area for open OHV use, desert tortoises still occupy these areas. A relatively large population of desert tortoises persists in the western expansion area (based on the number of desert tortoises to be translocated). While clearance surveys will be conducted in the high- and moderate-intensity disturbance areas, as we have stated desert tortoises will continue to occupy the broader western expansion area. We have also provided a rationale for why we believe desert tortoises will continue to persist, albeit at lower densities, in the existing installation in spite of the proposed military training scenarios (see the Effects of Military Activities section in this biological opinion). For these reasons, we anticipate that desert tortoise populations will persist in the western expansion area and in the existing installation, and that the broader linkage will not be adversely affected by the proposed action.

Effects of Conservation Actions

Below we consider the general effects of the Marine Corps' proposed conservation actions outside of the expanded installation, but we do not have sufficient information on some of the conservation actions to conduct a detailed analysis of their effects on the desert tortoise. For example, without information on the timing and location of specific actions, we cannot estimate the number of desert tortoises that may be involved.

Special Use Areas

The Marine Corps will establish or upgrade five Category 1 special use areas within the expansion areas and MCAGCC installation that would restrict mechanized maneuvers, off-road vehicle travel, bivouac sites, and any other military training involving off-road vehicle activity (see Figure 5). These areas include one special use area in the western expansion area (26.3 square kilometers), one special use area in the southern expansion area (11.9 square kilometers), one special use area in the Sunshine Peak Training Area (8.0 square kilometers), one special use area in the southern portion of the Bullion RTA (22.3 square kilometers) and the upgrading of an existing special use area in the Sunshine Peak and Lavic Training Areas that is contiguous with new ACEC lands (36.0 square kilometers). The Marine Corps will sign these areas, and fence them on the sides near proposed maneuver areas and the Johnson Valley Off-highway Management Vehicle Area, to reduce the potential for effects from training activities and unauthorized access.

These actions will result in 104.5 total square kilometers of land within and contiguous to the MCAGCC installation being managed to achieve conservation goals. To put the collective size of these areas into perspective, they equal approximately 68.2 percent of the combined high-and moderate-intensity disturbance areas and approximately 9.0 percent of the total area of the Ord-Rodman ACEC. We anticipate that these actions will lead to enhanced protection for desert

tortoises and desert tortoise habitat, and will partially offset other adverse effects related to the proposed action that have been analyzed in this biological opinion and in our previous 2012 biological opinion (Service 2012f).

Conservation Management of Adjacent Public Lands

During the 2012 consultation, the Marine Corps proposed the incorporation of two parcels of land into the Ord-Rodman ACEC which lie adjacent to the MCAGCC installation and the ACEC. The National Defense Authorization Act that formally transferred land to the Marine Corps prescribed that the smaller of these parcels, an 11.5 square kilometer portion of the Johnson Valley OHV management Area, remain open to OHV use. As mentioned in the Environmental Baseline of this biological opinion, the signing of the Record of Decision for the DRECP Land Use Plan Amendment resulted in the incorporation of the other parcel, as well as an additional parcel of Bureau lands (totaling 113.1 square kilometers) into the southeast and southwest portions of the Ord-Rodman ACEC (Bureau 2016; see Figure 5).This effectively increases the size of the ACEC by approximately 9.8 percent, which will lead to better conservation for desert tortoises and their habitat in areas contiguous to the action area. We anticipate that these more recent management actions in the ACEC will result in added protections against mortality for desert tortoises, which will provide a degree of buffering against adverse effects related to the proposed action that have been analyzed in this biological opinion and in our previous 2012 biological opinion (Service 2012f).

Law Enforcement

The Marine Corps will coordinate with the Bureau to develop mutually agreeable measures to patrol for and prevent off-route travel in the Ord-Rodman ACEC. This will include the implementation of ten ground patrols per year by Conservation Law Enforcement Officers (CLEOs) in translocation recipient and control sites in the Ord-Rodman ACEC, as well as aerial patrols via helicopter as flight hours become available. The patrols will aim to reduce off-route travel and will coincide with the desert tortoise active seasons as well as peak OHV use periods. Patrols of the remaining ACEC areas will take place incidental to transit of CLEOs between sites.

Similar to the effects of road travel and vehicular use as discussed for other aspects of the proposed action, there is some potential for desert tortoises to be killed on roads by vehicular strike. Small desert tortoises are at a higher risk due to difficulties with detecting them on road surface. Because of this, we expect there to be some mortality over the life of the translocation program of small desert tortoises, but we do not expect there to be mortality of large desert tortoises. The Marine Corps will implement the standard measures used in other portions of the MCAGCC installation, which includes speed limits and driver awareness training for CLEOs performing patrols. The use of helicopters will be aerial in nature and we do not expect these patrols to have effects on desert tortoises or on critical habitat within the ACEC. We anticipate that the CLEO patrols will augment other measures being implemented by the Marine Corps to deter off-route OHV use in the ACEC (e.g., OHV barriers), will enhance protection of desert

tortoises in the recipient and control sites, will contribute to the overall success of the translocation, and by adding protections against mortality in the ACEC will partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we are unable to predict the level of mortality associated with off-route OHV travel in the ACEC.

Predator Monitoring and Targeted Control

In addition to the continuance of policies at MCAGCC to reduce predator subsidies (e.g., water, food), the Marine Corps has developed a predator management plan specific to this translocation that focuses on monitoring and control of coyote populations. Predator use of recipient and control sites, and predation events on desert tortoises, will be regularly documented within the three sample desert tortoise populations being monitored post-translocation. Monitoring will be supplemented by CLEO patrols in the recipient and control sites in the Ord-Rodman ACEC. The Marine Corps will implement methods to target and remove offending coyotes from recipient and control sites if predation rates of desert tortoises by coyotes exceed those of control populations, or if a predation event is identified. This will be accomplished by increasing coyote hunting that has been authorized in Bureau-managed lands through an on-base hunter education program, and by removal of offending coyotes by CLEOs incidental to normal patrols. We expect the predator management plan to contribute to the overall success of the translocation.

As described previously, there is some potential for desert tortoises to be killed on roads by vehicular strike during the removal of offending coyotes. Small desert tortoises are at a higher risk due to difficulties with detecting them on road surface. Because of this, we expect there to be some mortality over the life of the translocation program of small desert tortoises, but we do not expect there to be mortality of large desert tortoises. The Marine Corps will enforce speed limits and provide driver awareness training to all personnel (military and civilian) who participate in the hunting program. With these measures implemented, we do not anticipate a significant level of mortality of small desert tortoises, and we do not anticipate the mortality of large desert tortoises as a result of predator management. By removing offending coyotes from the recipient and control sites the Marine Corps will protect against further mortality due to predation, which will partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we are unable to predict the level of mortality associated with predation.

Off-highway Vehicle Unauthorized Route Closures

The Marine Corps will coordinate with the Bureau to identify, close, and rehabilitate unauthorized routes to reduce the effects of displaced OHV recreation in the Ord-Rodman ACEC and the translocation recipient sites, as follows: 1) obscure closed unauthorized routes within the recipient sites and dispersal areas located within the Ord-Rodman ACEC through use of vertical mulching or other means, and 2) obscure closed unauthorized routes within a 100-meter buffer of OHV barriers that separate the Johnson and Stoddard Valley OHV Management Areas from the Ord-Rodman ACEC. Closure of unauthorized routes will be undertaken by the Bureau, and

rehabilitation activities by the Marine Corps are subject to future Bureau review and authorization such as a right-of-way or memorandum of understanding. We anticipate that rehabilitation of these routes will involve vehicular travel and would result in the same potential risk for mortality to desert tortoises by vehicle strike as discussed earlier, with small desert tortoises being more vulnerable. With the proper measures implemented (speed limits and driver awareness training), we do not anticipate a significant level of mortality of small desert tortoises, and we do not anticipate the mortality of large desert tortoises as a result of closed route rehabilitation efforts. We do anticipate that rehabilitation of closed routes will reduce desert tortoise mortality in the ACEC by reducing the level of OHV use in some areas. This would partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we do not have data on desert tortoise densities in the areas that would be affected, and we are unable to predict the level of mortality associated with off-route OHV travel in the ACEC.

Off-highway Vehicle Barriers

The Marine Corps will install OHV barriers to reduce off-route travel in the Ord-Rodman ACEC (see Figure 6). The Marine Corps will perform long-term maintenance of OHV barriers, desert tortoise exclusion fencing, and route closures that are implemented on public lands subject to Bureau authorization such as a right-of-way or memorandum of understanding. The final location of barriers may vary from the alignments proposed in this biological opinion to address private property and grazing allotment constraints, but tentatively include the following Bureau-approved locations and focus areas, with the protections that we anticipate to occur:

1. Along the east side of Highway 247 between the Kern River Gas Line right-of-way (north) to the location where Highway 247 reaches the base of Stoddard Ridge (south); the north end of this alignment, from the Kern River right-of-way to the southern end of the Stoddard Valley OHV Management Area, will incorporate desert tortoise exclusion fencing
    - This barrier will protect against off-route travel in the northwestern ACEC in areas adjacent to the Stoddard Valley OHV Management Area; this area contains a desert tortoise population identified as essential for recovery.
    - Desert tortoise exclusion fencing along the east side of Highway 247 for the length of the Stoddard Valley OHV Management Area will prevent desert tortoises from the northwestern portion of the ACEC from moving onto and being struck by vehicles on Highway 247 and in the Stoddard Valley OHV Management Area.

2. Along the north side of Camp Rock Road from the southern boundary of the Ord-Rodman ACEC north to the Ord Mountain grazing allotment boundary
    - This barrier will protect against off-route travel in the southern ACEC in areas adjacent to the Lucerne-Ord recipient site, particularly OHV use originating in three popular staging areas along Camp Rock Road.

3. Along the north side of the powerline road (BLM route number: NR 8465) from the isolated and disjunct portion of the Johnson Valley OHV Management Area (T6N, R4E, Section to the larger portion of the Johnson Valley OHV Management Area(T6N, R3E, Section 13)
    - This barrier will protect against off-route travel in the southern ACEC in areas adjacent to the Johnson Valley OHV Management Area (provisional barrier; see description of Conservation Actions in the Project Description section of this biological opinion) and in areas adjacent to the powerline access road.

4. Along the Bureau ownership boundaries from Camp Rock Road at the southern end of the Ord-Rodman ACEC, west to a point where topography forms a barrier to OHV entry
    - This barrier will protect the Lucerne-Ord recipient site in the southwestern ACEC, and the resident and translocated desert tortoises contained within, against OHV incursion from the Johnson Valley OHV Management Area as well as from residential areas in the Lucerne Valley; this is a focus area for population augmentation via translocation and contains a desert tortoise population identified as essential for recovery.

We anticipate that the installation of a desert tortoise exclusion fence along the east side of Highway 247 will prevent desert tortoises in northwest portion of the ACEC from moving onto Highway 247. However, without a fence along the west side of the highway this could create a situation where desert tortoises moving across the road in a west to east direction would be prevented from entering the ACEC and could become entrapped between the fence and the road, having to then cross the road twice in order to return to their point of origin. This could increase mortality for desert tortoises on the west side of the highway.

We anticipate that the installation of OHV barriers will enhance protection of desert tortoises in the ACEC, and in particular the Lucerne-Ord recipient site. This will contribute to the overall success of the translocation, and by adding protections against mortality in the ACEC will partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we do not have data one desert tortoise densities in the specific areas identified, and we are unable to predict the level of mortality associated with off-route OHV travel in the ACEC.

Desert Tortoise Exclusion Fencing on the MCAGCC Installation

The Marine Corps will install desert tortoise exclusion fencing within the MCAGCC installation at the interface of training areas with Galway Lake/Bessemer Mine special use areas, Cleghorn Lake special use area, and the Siberia recipient site (see Figure 9) to reduce the potential for mortality of desert tortoises that may try to enter heavy-disturbance areas. When desert tortoises encounter exclusion fencing, they often exhibit fence-pacing behavior that can increase their exposure to predators and temperature extremes; the Marine Corps has proposed to monitor new fences after they are installed to reduce the likelihood that desert tortoises would be killed while pacing fences, thus we do not expect that fencing will result in the mortality of desert tortoises.

We anticipate that this fencing will prevent desert tortoises from re-entering training areas from the Siberia recipient site and would be effective in reducing mortality. This will partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we are unable to predict the number of desert tortoises that will attempt to migrate into training areas within the MCAGCC installation.

Habitat Rehabilitation Identification and Reporting

During CLEO patrols, the Marine Corps will identify sites within the Ord-Rodman ACEC in need of habitat restoration. Any action to rehabilitate habitat will be conducted by the Bureau and effects to desert tortoises and to critical habitat would be subject to other existing consultations. We anticipate that efforts to rehabilitate habitat would improve desert tortoise habitat conditions in the areas affected.

Funding of Line Distance Sampling

The Marine Corps will contribute funds to support Service range-wide monitoring efforts for the desert tortoise within the Ord-Rodman ACEC as a means of looking at how the effects of their translocation program and population augmentation fit into the broader context of population trends within the Ord-Rodman ACEC. These funds will help support Service line distance sampling efforts into the future and will provide beneficial effects to our understanding of desert tortoise populations in the ACEC.

Enhanced Clearance Survey Protocol

An enhanced clearance survey protocol has been developed to increase the number of desert tortoise located and removed from high- and moderate-intensity disturbance areas and further minimize the risk of injury or mortality to desert tortoises that could otherwise be missed during surveys. It will also increase the amount of time spent surveying in these areas which would increase the probability that desert tortoises migrating from adjacent areas would be found. This protocol is meant to be more conservative in its approach than the clearance survey protocol developed during the 2012 consultation. We anticipate that these surveys would be effective in removing additional desert tortoises and would reduce mortality in the expansion areas. This will partially offset the mortality of desert tortoises due to other aspects of the proposed action. We are unable to quantify the magnitude of this because we are unable to predict the number of desert tortoises that will be located in the high- and moderate-intensity disturbance areas.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Department of Defense and the Bureau manage all of the land in the action area; any future action on public

lands will require consultation, pursuant to section 7(a)(2) of the Endangered Species Act. Consequently, we do not anticipate any cumulative effects.

CONCLUSIONS

Desert Tortoise

As we stated previously in this biological opinion, "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). This regulatory definition focuses on how the proposed action would affect the reproduction, numbers, or distribution of the species under consideration in the biological opinion. For that reason, we have used those aspects of the desert tortoise's status as the basis to assess the overall effect of the proposed expansion of military training activities at the Marine Corps Air Ground Combat Center (MCAGCC) on the species.

Additionally, we determine whether a proposed action is likely "to jeopardize the continued existence of the species" through an analysis of how a proposed action affects the listed taxon within the action area in relation to the range of the entire listed taxon. For the desert tortoise, this process involves considering the effects at the level of the action area, then at the level of the recovery unit (in this case, the Western Mojave recovery unit), and then finally for the range of the listed taxon. Logically, if a proposed action is unlikely to cause a measurable effect on the listed taxon within the action area, it is unlikely to affect the species throughout the recovery unit or the remainder of its range. Conversely, an action with measurable effects on the listed entity in the action area may degrade the status of the species to the extent that it is affected at the level of the recovery unit or range wide.

In the following sections, we will synthesize the analyses contained in the Effects of the Action section of this biological opinion to determine how the proposed action affects the reproduction, number, and distribution of the desert tortoise. We will then assess the effects of the proposed action on the recovery of the species and whether it is likely to appreciably reduce the likelihood of both the survival and recovery of the desert tortoise.

Reproduction

The proposed expanded military training and translocation of desert tortoises has the potential to affect reproduction in a number of ways. As we discussed in the Effects of the Action section of this biological opinion, the number of clutches may be lower in translocated females than in residents. Egg production and clutch size may be less productive in females in the first year post-translocation, however the mean number of eggs produced returned to resident and control levels after this period. There is also evidence that male translocated desert tortoises may be delayed in assimilating into their new populations; however, these data cover only a short-term period as compared to the reproductive time period for a large desert tortoise.

We have estimated the loss of between 556 and 614 large (i.e., reproductive) desert tortoises in the existing MCAGCC installation and between 43 and 68 reproductive large desert tortoises within the expansion areas. As noted previously, our mortality estimates for the existing installation are likely overestimates because they are based on survey data from the late 1990s. Populations on the existing installation have likely declined since the late 1990s considering the downward trend in population size in the Western Mojave Recovery Unit and the military training that has occurred under the 2002 biological opinion (Service 2002). The anticipated loss of reproductive large individuals would not occur at a single in point and time but would extend over a 50-year time horizon. With the exception of high-intensity disturbance areas, which comprise a small portion of the overall action area, we anticipate that populations will continue to persist, and would continue to be reproductive in spite of military activities in the action area. Consequently, reproductive large desert tortoises across most of the action area, including areas affected by military training, will continue to be reproductively active and produce eggs.

We have estimated the loss of between 2,619 and 2,894 small (i.e., non-reproductive) desert tortoises in the existing MCAGCC installation and between 352 and 1,908 non-reproductive small desert tortoises within the expansion areas. We expect that this mortality is an overestimate due to the difficulties in estimating non-reproductive small desert tortoise abundance that we have previously discussed. Natural mortality rates for non-reproductive small desert tortoises are higher than for reproductive large individuals. While some individuals in this size class could be within 5-10 years of reproductive capability, we anticipate that over this time frame, and over the 50-year time frame of the proposed action, a large proportion of these animals would be lost to natural mortality sources given the noted higher rate of natural mortality.

As described previously, we did not provide an estimate for the number of eggs that would be lost as a result of military training activities. Eggs that are produced by the majority of desert tortoises within the action area will not be affected by military training. In areas where eggs would be lost, we anticipate that the loss of eggs would not be significant at a population level because areas where eggs would be lost within the action area and the population of reproductive adults within these areas that would produce them comprises a small proportion of the reproductive capacity of the action area and the Western Mojave Recovery Unit. In addition, most of the eggs that may be lost due to military activities are unlikely to produce individuals that would reach reproductive age due to high rates of natural mortality.

The Marine Corps proposes to translocate approximately 998 large and 547 small desert tortoises from areas of high- and moderate-intensity disturbance in the western and southern expansion areas into areas where populations of resident animals are currently depleted. We anticipate that a large proportion of these reproductive animals would be otherwise killed if left in place in the disturbance areas. Desert tortoises from these areas will augment populations within the Western Mojave Recovery Unit that are currently below a minimum viable density threshold, which relates directly to a population’s ability to reproduce and maintain evolutionary potential and population persistence over time. The Lucerne-Ord recipient site in particular will receive translocated animals into a population that is not only currently depleted, but is also a population that we have described as essential to the recovery of the desert tortoise. Although we expect

some short-term negative impacts to reproduction in the translocated population, we expect that the augmentation of reproducing individuals into these areas will create a net benefit for local populations and will contribute toward these populations regaining long-term viability.

As stated in our 2002 biological opinion, desert tortoises in portions of the action area that will be affected by military training do not comprise a population that is essential to the long-term survival and recovery of the species in the Western Mojave Recovery Unit. As stated in the Status of the Species section of this biological opinion, the three conservation areas in the Western Mojave Recovery Unit have an estimated population size of approximately 17,644 large (i.e., reproductive) individuals. Portions of the recovery unit outside these areas, like the expanded installation, are also occupied by desert tortoises, thus we anticipate that the overall population size in the recovery unit is much larger. As we have described above, we anticipate the loss of reproductive large individuals, small individuals, and eggs within portions of the action area affected by military training, but we anticipate that this loss represents a small percentage of the overall size of the reproductive population in the recovery unit. In addition, areas where loss of reproductive large individuals, small individuals, and eggs would occur are outside areas identified as essential to conservation of the species in the Western Mojave Recovery Unit. Complete loss of reproductive large individuals, small individuals, and eggs is only likely to occur in the small portion of the action area comprised of high-intensity disturbance areas. In all other portions of the action area, including other areas affected by military training, we anticipate the retention of reproductive populations. In addition, the translocation of desert tortoises from the expansion areas to the Ord-Rodman ACEC and other recipient sites will save the reproductive capacity of these individuals by removing them from high- and moderate-intensity disturbance training areas. It will also augment the reproductive capacity of existing populations within the Ord-Rodman ACEC, which is a conservation area that is essential to the recovery of the species. For these reasons, we conclude that the proposed action's effects on desert tortoise reproduction would not substantially compromise reproduction of the species.

Numbers

Military activities will result in mortality of up to 614 large and 2,894 small desert tortoises within the existing installation and up to 68 large and 1,908 small desert tortoises within the expansion areas. We also anticipate the mortality of a small number of additional individuals in other portions of the expanded installation. Tables 25 and 26 summarize our estimates for mortality within the existing MCAGCC installation and expansion areas. The Marine Corps would capture and translocate approximately 916 large and 507 small desert tortoises in the expansion areas prior to military training, as well as an additional 82 large and 40 small animals predicted to be found in subsequent clearance surveys. We have indicated that handling individuals for translocation is likely to kill few, if any, desert tortoises. In addition, the best available science indicates that translocation is unlikely to increase the overall mortality rate of the translocated population above that of control populations. As noted previously, we do not expect that desert tortoise eggs will be found during clearance surveys, and we are not providing an estimate for the number of eggs that would be lost due to military training. We expect the

enhanced clearance survey protocol developed since the 2012 consultation to reduce the number of desert tortoises that are killed by locating and removing more animals from the high- and moderate-intensity disturbance areas.

Table 25. Estimates of the number of desert tortoises likely to be killed within the current boundaries of the MCAGCC

Area	Large Desert Tortoises	Small Desert Tortoises
High-intensity Disturbance Areas	254 to 312	1,197 to 1,471
Moderate-intensity Disturbed Areas	302	1,422
Total	556 to 614	2,619 to 2,894

Table 26. Estimates of the number of desert tortoises likely to be killed within the expansion areas

Area	Large Desert Tortoises	Small Desert Tortoises
High-intensity Disturbance Areas	10 to 43	272 to 1,182
Moderate-intensity Disturbed Areas	3 to 25	79 to 726
Total	13 to 68	351 to 1,908

In our 2012 biological opinion, we estimated that the MCAGCC and the proposed expansion areas contained an approximate population of 12,809 large desert tortoises. We estimated that 96,140 large desert tortoises reside in the portions of the range outside of MCAGCC and the expansion areas (based on Service 2010c). While we estimated that the three ACECs in the Western Mojave Recovery Unit contained 20,760 large individuals (based on Service 2010c), we now have data (Service 2015b) that provides a more recent estimate of 17,644 large individuals in these ACECs. This represents a decline of approximately 15 percent since 2010 and is placed into context by trend analysis that indicates a 50.7 percent decline in these ACECs since 2004 (Service 2015b). The Ord-Rodman ACEC has sustained a sharper decline than the other two ACECs, and is currently estimated to have an abundance at least 28 percent lower than in 2010 (decline in density from 5.0 to 3.6 large desert tortoises per square kilometer; Service 2015b). We note that these data are for large desert tortoises; no population estimates exist for small desert tortoises beyond the life table estimation techniques used in this biological opinion.

Although we do not have population estimates to cover other occupied habitat across the species' range, the Environmental Baseline section identifies additional areas within the recovery unit where desert tortoises occur. As noted previously, because of these occupied areas outside the three ACECs, we anticipate that the population size in the recovery unit as a whole is much larger than the numbers stated. Similar occupied areas with no population estimates exist in other recovery units. Consequently, we anticipate that the estimated mortality associated with the proposed action comprises a small percentage of the large desert tortoise population in the Western Mojave Recovery Unit and range wide. Given our likely overestimate in the characterization of mortality, the actual loss of individuals will likely comprise an even smaller percentage. Although we have no range-wide estimates of the number of small desert tortoises, given the number of large animals documented through range-wide monitoring and the information we have discussed regarding yearly female reproductive output, the loss of small

desert tortoises associated with the proposed action would also comprise a small percentage of the total recovery unit population.

Finally, we expect that conservation actions that have been approved by the Bureau and that will be implemented by the Marine Corps (i.e., predator management plan, OHV barriers, and desert tortoise exclusion fencing) will reduce and partially offset the level of mortality associated with the proposed military training. We anticipate that the translocation of desert tortoises from the expansion areas will augment currently depleted populations in other areas to levels that achieve minimum viable densities, and will move these populations closer to levels of long-term persistence. We expect that the Marine Corps will coordinate with the Bureau to gain necessary authorizations for additional conservation actions to contribute to the long-term success of the translocation program (i.e., law enforcement patrols and OHV closed route rehabilitation). We anticipate that the number of desert tortoises that we have estimated would be killed by military training would be offset by the translocation of individuals from the disturbance areas, and overall would comprise a small percentage of desert tortoises in the recovery unit. For these reasons we conclude that the proposed action would not substantially affect the number of desert tortoises in the Western Mojave Recovery Unit.

Distribution

We anticipate that desert tortoises will continue to persist in all but the most heavily disturbed areas of the existing installation. Although desert tortoises could be lost from areas identified for high-intensity disturbance, these areas are relatively localized within MCAGCC and the action area as a whole. Our analysis of population fragmentation indicates that the proposed action is unlikely to result in extirpation of desert tortoises from the existing installation or the expansion areas. We have determined that these losses would not be of sufficient magnitude to result in genetic deterioration, demographic stochasticity, or other effects that could compromise population viability over a large area (see discussion of minimum viable population density in the Status of the Desert Tortoise in the Action Area section of this biological opinion). Even if military activities resulted in the loss of desert tortoises from all 42.8 square kilometers of areas identified for high-intensity disturbance, this loss would not appreciably affect the distribution of the species given the extent of occupied habitat across the Western Mojave Recovery Unit and the entirety of the species' range.

We have reached this conclusion because the 42.8 square kilometers of high-intensity disturbance area comprise approximately 0.05 percent of the modeled desert tortoise habitat in the western Mojave Desert region. (See the calculations of modeled habitat and impervious surfaces in the Status of the Desert Tortoise section of this biological opinion.) Consequently, even if we assumed that training would eliminate all desert tortoises from within this area, the loss of this area would comprise a minor portion of the western Mojave Desert. Training would not eliminate desert tortoises from most of the high-intensity disturbance areas, the 42.8 square kilometers are disbursed across a large area, and the range-wide modeled habitat of the species covers approximately 68,501.9 square kilometers; again, see calculations in the Status of the

Desert Tortoise section of this biological opinion. For these reasons, we conclude that the proposed action would not appreciably reduce the distribution of the desert tortoise.

Effects on the Recovery of the Desert Tortoise

Above, we have considered how injury and mortality would affect current recovery unit and range-wide distribution, abundance, and reproduction of the species. We must also consider how the proposed action would affect the recovery potential of the desert tortoise. To achieve recovery, each recovery unit must contain well distributed, self-sustaining populations across a sufficient amount of protected habitat to maintain long-term population viability and persistence (Service 2011c). Based on the information we have discussed in this biological opinion, the current amount of protected habitat (i.e., ACECs and other Tortoise Conservation Areas) in the Western Mojave Recovery Unit is sufficient to achieve these requirements. As previously discussed, these conservation protections have recently been supplemented by the addition of 113.1 square kilometers of new ACEC lands to the Ord-Rodman ACEC resulting from the implementation of the Bureau's DRECP Land Use Plan Amendment (Bureau 2016). However, as we have also discussed, densities within the three ACECs in the Western Mojave Recovery Unit have all declined to below the minimum viable threshold and are not maintaining the levels required for long-term population persistence. The Ord-Rodman ACEC in particular has experienced a sharp decline in density since our 2010 estimate, which is the estimate we used for our 2012 consultation and analysis of effects. This ACEC is relatively small in comparison to the other two ACECs in the recovery unit, and is isolated by contiguous lands not currently being managed for conservation. It should be noted, however, that future actions through the DRECP will establish additional parcels of areas to be managed for conservation within these contiguous lands.

Clearly, the Marine Corps' proposed action is likely to alter existing conditions and affect desert tortoises in the action area. However, the proposed action will not have effects in the Ord-Rodman ACEC or in other conservation areas in the Western Mojave Recovery Unit. To the contrary, the management of the special use areas identified by the Marine Corps would functionally increase the protected areas associated with the Ord-Rodman ACEC by an area approximately 9.0 percent of its current size. This would bring the ACEC closer to the geographic size needed for long-term viability in the event that populations in the contiguous areas are lost. The conservation actions proposed to control human access and effects from historic off-route OHV use would also reduce threats within the ACEC, which may improve its resiliency. We expect the translocation of desert tortoises to augment currently depleted populations in the respective recipient sites to levels that exceed minimum densities for population viability. In particular, desert tortoises translocated to the Lucerne-Ord recipient site would augment a depleted population in the southwestern portion of the ACEC; this is a population that we have described as essential to the recovery of the species. We anticipate that the conservation actions and management proposed to protect this recipient site and this portion of the ACEC will help buffer the population against the decline that has been documented throughout the broader recovery unit.

Preservation of connectivity between areas of protected habitat (i.e., ACECs) is needed for recovery to address the potential effects of climate change and to preserve long-term gene flow and genetic variability (Service 2012b). Our analysis shows that the proposed expansion would affect an identified linkage area that connects the Ord-Rodman ACEC to Joshua Tree National Park. However, we have also concluded that desert tortoises would continue to occupy this linkage under the proposed training scenario.

In summary, the proposed action would have undeniable effects to desert tortoises on the MCAGCC and the expansion areas through the injury and mortality of individuals. However, based on documented declines within the Western Mojave Recovery Unit and throughout the broader range, some portion of this injury and mortality would occur regardless of the proposed action. The translocation of desert tortoises to augment depleted populations is a direct way to increase densities and move toward viable populations in terms of evolutionary potential and long-term population persistence. We anticipate this to result in beneficial effects to the recovery of the species in the Western Mojave Recovery Unit.

Conclusion

After reviewing the current status of the desert tortoise, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action by the Marine Corps is not likely to jeopardize the continued existence of the desert tortoise. In addition to the previous discussion on the effects of the proposed action on the reproduction, numbers, and distribution, we have reached this conclusion because:

1. The Marine Corps would implement numerous measures to reduce the level of injury and mortality associated with the proposed action.

2. The Marine Corps will implement an enhanced clearance survey protocol in order to increase the number of desert tortoises captured and translocated from high- and moderate-intensity disturbance areas. This will further minimize the number of desert tortoises injured or killed in these areas.

3. The injury and mortality of desert tortoises within MCAGCC would not result in an appreciable change in what this area currently experiences under existing land uses that we have previously analyzed in other biological opinions.

4. Relative to the number of desert tortoises that occur in the Western Mojave Recovery Unit and range wide, the proposed action would injure or kill a small portion of the population.

5. Relative to the amount of occupied desert tortoise habitat in the Western Mojave Recovery Unit and range wide, the proposed action would result in complete loss of

desert tortoises from only small, localized areas but would not appreciably affect distribution of the species.

6. Population and habitat fragmentation associated with the proposed action would not result in loss of desert tortoises from large areas.

7. The majority of injury and mortality associated with the proposed action would occur in areas that are not important to recovery of the species.

8. Translocation of desert tortoises will be a beneficial action that will remove most of the desert tortoises in high- and moderate-intensity disturbance areas to avoid injury or mortality.

9. Translocation of desert tortoises would augment depleted populations of desert tortoises, including populations within areas that are essential to conservation of the species (i.e., Ord-Rodman ACEC).

10. The Marine Corps would implement numerous measures to protect translocated desert tortoises from injury and mortality due to OHV effects.

11. The Marine Corps will implement a predator management plan in the translocation recipient sites that will protect translocated and resident desert tortoise populations from injury or mortality due to predation.

12. The Marine Corps' funding of OHV barriers, obscuring closed unauthorized routes, identification, and habitat rehabilitation mapping in the Ord-Rodman Critical Habitat Unit will improve protection of this area and reduce threats to its important populations, which, along with its funding of monitoring and line distance sampling, will improve our ability to recover the desert tortoise.

13. The Marine Corps' proposed special use areas, in combination with the Bureau's designation of new ACECs under the DRECP, have increased the amount of conserved land within the range of the species and will functionally increase the size of the protected areas associated with this ACEC and improve the long-term potential for maintaining population viability there. These changes in land use will improve our ability to recover the desert tortoise.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to "include significant habitat modification or degradation where it actually kills or injures wildlife by significantly

impairing essential behavioral patterns, including breeding, feeding or sheltering." 50 CFR 17.3. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement and occurs as a result of the action as proposed by the Marine Corps.

The measures described below are non-discretionary. The Marine Corps has a continuing duty to regulate the activities covered by this incidental take statement. If the Marine Corps fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. To monitor the effect of incidental take, the Marine Corps must report the progress of its action and the effect on the species to the Service as specified in the incidental take statement (50 CFR402.14(i)(3)). The section 7(o)(2) exemption for incidental take that is provided by this biological opinion is extended to the Bureau for all activities associated with translocation that will occur within Bureau-managed lands.

We anticipate that the expansion of the MCAGCC is likely to result in the take of all desert tortoises and desert tortoise eggs in the high- and moderate- intensity disturbance areas of the expansion areas in the forms of capture (i.e., animals translocated from training areas) or injury or mortality (i.e., animals that are missed during translocation and subsequently injured or killed during training). We anticipate that some additional take will also occur in portions of the expansion area that are outside of the high- and moderate-intensity disturbance areas and in additional areas within the existing installation (i.e., pre-expansion). This take will also come in the form of capture (i.e., animals moved out of harm's way) or injury or mortality (i.e., animals that are injured or killed during training). We also anticipate that some desert tortoises in the translocation and control areas will be captured (i.e., to assist in monitoring the effects of translocation) and injured or killed (i.e., because of activities associated with translocation). We will describe the amount of take in the following sections.

Capture of Desert Tortoises for Translocation and Post-translocation Monitoring

Expansion Areas and Existing Installation

We anticipate that approximately 998[44] of the predicted 1,105[45] larger desert tortoises that may currently occupy the high- and moderate-intensity disturbance areas of the expansion will be taken in the form of capture for translocation. Only approximately 547[46] of the 5,152[47] smaller desert tortoises that may currently occupy these areas will be taken in the form of capture for translocation because of the difficulty finding smaller desert tortoises during clearance surveys. As described in the Environmental Baseline section, a subset of these individuals has already

[44] From Table 13, Environmental Baseline Section
[45] Calculated from Table 20, Effects of the Action Section
[46] From Table 10, Environmental Baseline Section
[47] Calculated from Table 20, Effects of the Action Section

been taken, in the form of capture, under the section 10(a)(1)(A) permit used to facilitate translocation planning activities required under the 2012 biological opinion. Due to the nature of the proposed action, we do not expect eggs to be located during military training, so we do not anticipate the collection of any eggs.

Based on the description in the post-translocation monitoring plan, we anticipate that 190 large and 35 small desert tortoises captured and translocated from high- and moderate-intensity disturbance areas in the expansion areas will be re-captured multiple times during the initial 5-year post-translocation monitoring period to facilitate health assessments, transmitter replacement, and other activities associated with post-translocation monitoring. For a smaller subset of these individuals (50 individuals), take associated with re-captures would occur over a more extended period (30 years) to provide for long-term post translocation monitoring.

In all other portions of the expanded installation, we anticipate the capture of few desert tortoises because clearance surveys will not occur outside of the high- and moderate-intensity disturbance areas of the expansion areas, so the only potential for capture would occur when desert tortoises are moved out of harm's way during training. In addition, areas outside of the high- and moderate-intensity disturbance areas of the expanded installation areas will receive less use, and military activities that may result in moving animals out of harm's way will be infrequent.

Because of all of the variables involved, which we have discussed in depth in the biological opinion, the numbers we have provided in the previous paragraphs are estimates. Captures to facilitate translocation of desert tortoises from the high- and moderate-intensity disturbance areas in the expansion areas and other captures associated with moving animals out of harm's way in other portions of the expanded installation will reduce the number of desert tortoises that are killed or injured by training. The reduction in animals that are killed or injured is beneficial to the species because it will reduce the proposed action's overall effect. Consequently, we are not basing re-initiation of formal consultation on the number of individuals that may be captured for translocation or to move individuals out of harm's way in these areas.

Given the scale of the translocation and the extended period that post-translocation monitoring will cover, some potential exists for injury and mortality due to implementation of these activities. Based on previous translocations and post-translocation monitoring efforts, we anticipate that few individuals are likely to be killed or injured due to these activities. We cannot predict an exact number because of the numerous variables involved. We will consider the amount or extent of take to be exceeded if the Marine Corps kills or wounds 6 large desert tortoises during implementation of translocation or post-translocation monitoring activities in the translocated population.

Control and Recipient Sites

Based on the description in the post-translocation monitoring plan, we anticipate that 380 large and 70 small desert tortoises will be captured to facilitate monitoring of desert tortoises that are resident to the recipient sites or occur in control sites. The individuals captured in control and

recipient sites will be re-captured multiple times during the initial 5-year post-translocation monitoring period to facilitate health assessments, transmitter replacement, and other activities associated with post-translocation monitoring. For a smaller subset of these individuals (100 individuals), take associated with re-captures would occur over a more extended period (30 years) to provide for long-term post translocation monitoring. As described in the Environmental Baseline section, a subset of these individuals has already been taken, in the form of capture, under the section 10(a)(1)(A) permit used to facilitate translocation planning activities required under the 2012 biological opinion.

Given the scale of the translocation and the extended period that post-translocation monitoring will cover, some potential exists for injury and mortality due to implementation of these activities. Based on previous translocations and post-translocation monitoring efforts, we anticipate that few individuals are likely to be killed or injured due to these activities. We cannot predict an exact number because of the numerous variables involved. We will consider the amount or extent of take to be exceeded if the Marine Corps kills or wounds 12 large desert tortoises during implementation of translocation or post-translocation monitoring activities in the control or recipient populations.

Post-translocation Survival

We anticipate that the survival of desert tortoises in the translocated, resident, and control populations will be the same over the course of the 30-year monitoring program. The Marine Corps has proposed to use Kaplan-Meier survival curves to assess survival among these groups. To ensure that the effects of translocation are consistent with our analysis, we will consider the amount or extent of take to be exceeded if, at the end of the initial 5-year monitoring period, the p-value for the Kaplan-Meier[48] survival curves in the translocated and resident groups are statistically different (alpha = 0.05) from each other or from the control group. This analysis will require that the Marine Corps control for variables, such as MCL in order to ensure an accurate comparison. Following the initial 5-year monitoring period, we will consider the amount or extent of take to be exceeded if the survival curves for the translocated and resident groups are statistically different from each other or from the control group in any subsequent 5-year monitoring period.

Injury and Mortality of Desert Tortoises during Training and Preparation Work within the Expanded MCAGCC

Take associated with training, the preparation of training sites, and construction and maintenance of infrastructure (up to 150 acres per year) within the existing boundaries of MCAGCC has been exempted under a previous biological opinion (Service 2002; 1-8-99-F-41). This incidental take statement supersedes the incidental take statement in the 2002 biological opinion for training and the preparation of training sites. For all other aspects of base operations that are not associated

[48] If proposed by the Marine Corps, the Service will consider other survival models for analysis of cumulative survival over these 5-year intervals if they provide the same information.

with the proposed action in this biological opinion (e.g., the construction and maintenance of infrastructure), the incidental take statement from the 2002 biological opinion (1-8-99-F41) remains in effect. This incidental take statement also supersedes the incidental take statement in the 2012 biological opinion for the expansion area.

We anticipate that some desert tortoises that are not translocated or moved out of harm's way within the expanded installation will be killed or injured during training activities or activities required to prepare training lands. Within the high- and moderate-intensity disturbance areas of the expanded installation, we anticipate that any of the desert tortoises that are not captured and translocated or moved out of harm's way will be killed or injured.

We anticipate that Marine Corps' training activities will not be the only source of mortality for individuals that remain on the expanded installation following translocation activities. Given the level of training that will occur in high-intensity disturbance areas, we anticipate that it will be a primary source of mortality across the entire installation and may kill or injure a relatively large proportion of the individuals that remain. Because training in moderate-intensity disturbance areas would be less frequent, we anticipate that injury and mortality caused by military activities would comprise a smaller proportion of the observed injury and mortality in these areas than in the high-intensity disturbance areas. We anticipate that the lower frequency of training within moderate-intensity disturbance areas in the expansion areas will combine with the low number of desert tortoises after translocation to result in a low number of injury and mortality in these areas. Training in all other portions of the existing installation would be even less frequent and would injure or kill an even smaller number of desert tortoises.

In the Effects of the Action section of this biological opinion, we anticipated that military training and training lands preparation activities would kill or injure up to 614 large and 2,894[49] small desert tortoises within the boundaries of the current installation. Within the expansion areas, we anticipated that military training and the preparation of training lands would kill or injure up to 68 large and 1,908[50] small desert tortoises. Because of all the variables involved, which we have discussed in depth in the biological opinion, the numbers we have provided here are estimates based on the best available science and use of reasonable assumptions. The actual number of individuals that military training and training lands preparation will kill or injure may vary.

The Marine Corps is unlikely to locate carcasses of most of the individuals it kills or injures because of the difficulty in locating smaller individuals, the cryptic nature of the species (i.e., some individuals may be killed in burrows and not located), and numerous other factors (e.g. presence of scavengers). The inability to locate a large proportion of these carcasses means that the number of carcasses that are found must serve as a surrogate for a larger number of unobserved mortalities, most of which will be small desert tortoises. Given this fact and the anticipated level of injury and mortality described above, we will consider the amount or extent

[49] Number of individuals anticipated to be killed or injured based on Table 18 in the Effects of the Analysis section.
[50] Number of individuals anticipated to be killed or injured based on Table 23 in the Effects of the Analysis section.

of take to be exceeded if the Marine Corps kills or injures 15 large desert tortoises in any given calendar year.

Displaced Off-highway Vehicle Recreation

Although this biological opinion does not re-analyze displacement of OHV recreation, we have included a discussion of it in this incidental take statement to reiterate how we are addressing take associated with this adverse effect. As stated in the Environmental Baseline section of this biological opinion, passage of the 2014 National Defense Authorization Act resulted in closure of the Exclusive Military Use Area to OHV recreation and resulted in intensifying adverse effects to desert tortoises in other portions of the Mojave Desert affected by this displacement. Because this displacement has already occurred, we have considered the ongoing effects of this displacement, as anticipated in the 2012 biological opinion, as part of the baseline condition that we are considering in this biological opinion. In the 2012 biological opinion, we expected that the amount of take of desert tortoises (in the form of injury or mortality) from OHV displacement would likely increase to a degree commensurate with the increase in use.

In the 2012 biological opinion, we noted that we had previously analyzed the effects of the authorized use of OHV recreation for several OHV management areas and the BLM's existing route network in other biological opinions. As we discussed in the Environmental Baseline section of this biological opinion, the incidental take statements in those biological opinions conveyed the section 7(o)(2) exemptions from the prohibitions against take resulting from such use. This exemption did not apply to take resulting from displaced unauthorized OHV use because the exemption for incidental take applies only to lawful activities. Because unauthorized OHV recreation is not a legal activity, the section 7(o)(2) exemption to the prohibition against take does not apply.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take of desert tortoises during implementation of the proposed action:

1. The Marine Corps must ensure that it adaptively manages the translocation to ensure that elevated mortality within translocated desert tortoises or within any individual translocation site is quickly identified and addressed.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Marine Corps must comply with the following term and condition, which implements the reasonable and prudent measure described in the previous section, and must comply with the reporting and monitoring requirements. These conditions are non-discretionary.

1. The following term and condition implements reasonable and prudent measure 1:

   The Marine Corps must perform an annual analysis of survival probability using known fate models[51] to determine if survival probabilities for desert tortoises in translocated and resident groups are statistically different (alpha = 0.05) from each other or from the control groups. This analysis must control for variables such as MCL in order to ensure accurate comparison. The Marine Corps must perform this analysis for the entire translocated population for each individual translocation site to determine if site-specific differences are evident. If, at any point, the Marine Corps' analysis shows that survival in translocated and resident groups are statistically different from each other or from the control group for the monitored population as a whole or for any individual translocation site, it must contact the Service to discuss the information collected up to that point to assess the reasons for differences in survival and apply appropriate adaptive management.

REPORTING REQUIREMENTS

By March 31 of each year this biological opinion is in effect, the Marine Corps must provide a report to the Service. The report will be submitted in electronic format and contain the following:

1. Details on each desert tortoise that is found dead or injured within the expanded installation (cause or suspected cause of death or injury, location, date carcass or injured individual was found, sex, midline carapace length, and other relevant biological information for injured or killed individual, and description of any veterinary treatment provided). The information must include any actions undertaken to prevent similar instances from occurring in the future.

2. An evaluation of the effectiveness of the protective measures that the Marine Corps implemented within the expanded installation.

3. Information related to translocated desert tortoise monitored through radio telemetry:
   a. The number of desert tortoises within each monitored group (translocated, resident, and control) at the end of the reporting period and a reporting on the number of desert tortoises added to the translocated population through additional clearance sweeps within the expansion areas or through release of individuals from TRACRS as part of the translocation.
   b. Information on desert tortoises remaining within each monitored group (e.g. sex, midline carapace length, weight, body condition score, health status, distance from initial release location, distance from location collected).
   c. Information on desert tortoises that are under quarantine prior to translocation (e.g. sex, midline carapace length, weight, body condition score, health status).

[51] If proposed by the Marine Corps, the Service will consider other models for analysis of annual survival if they provide the same information.

d. Map depicting release location for each translocated desert tortoise and all collected transmitter locations or other observations for the three monitored groups observed during the reporting period.
e. Information to characterize each injury or mortality observed within the monitored groups: 1) cause or suspected cause of death or injury, 2) location, 3) date carcass or injured individuals was found, 4) sex, midline carapace length, and other relevant biological information for injured or killed individual, and 5) description of any veterinary treatment provided.
f. Information on each desert tortoises in the monitored populations that have gone missing during the reporting period: 1) sex, midline carapace length, and other relevant biological information for the missing individual at the time last observed, 2) location last observed, 3) date last encountered, and 4) description of the effort made to locate the individual.

4. Information related to translocated desert tortoise within the Rodman-Sunshine Peak area that are monitored without telemetry:
   a. Description of methodology used to collect and analyze data.
   b. Information to characterize each injury or mortality observed within the monitored groups: 1) cause or suspected cause of death or injury, 2) location, 3) date carcass or injured individuals was found, 4) sex, midline carapace length, and other relevant biological information for injured or killed individual, and 5) description of any veterinary treatment provided.
   c. Summary of information collected on survival of translocated animals, population density, health status of translocated and resident population, habitat variables, predation, and other relevant information identified in the project description of this biological opinion.

5. Information collected on mark-recapture plots used for long-term monitoring of translocation effectiveness:
   a. Description of methodology used to collect and analyze data.
   b. Information to characterize each injury or mortality observed within the monitored groups: 1) cause or suspected cause of death or injury, 2) location, 3) date carcass or injured individuals was found, 4) sex, midline carapace length, and other relevant biological information for injured or killed individual, and 5) description of any veterinary treatment provided.
   c. Summary of information collected on survival, assimilation, demography, health status, predation and other threats to the translocation area, and habitat stability and change, and other relevant information identified in the project description of this biological opinion.

6. Information associated with post-translocation research identified in the project description (i.e., experimental translocation densities, cattle grazing compatibility, constrained dispersal, effects of translocation distance, and efficacy of headstarting as a translocation tool).

a. Description of methodology used to collect and analyze data.
b. Discussion of results, when available.

7. A table that includes an estimate (to the nearest 0.2 cubic centimeters) of the volume of unused blood and serum that remains from the sample(s) collected from individual desert tortoises. For each sample of unused blood, the table will also include: (i) a unique identifier number for the desert tortoise that blood was drawn from; (ii) the date the blood was collected; and (iii) the name of the facility where the unused blood or serum is stored.

8. Results of annual survival probability analysis and 5-year cumulative survival probability analysis (during applicable year) required by the Incidental Take Statement and Terms and Conditions (see above).

9. A description of activities that the Marine Corps implemented or funded as part of its conservation program for the desert tortoise within habitat of the desert tortoise. This would include actions implemented on the expanded installation and actions that the Marine Corps would contribute to on BLM land, as described in the project description of this biological opinion.

In addition to the reporting requirements identified above, the Marine Corps will develop a data management plan that outlines how it will provide for long-term maintenance, evaluation, archiving, quality assurance, quality control, and data access. This plan should address data management standard operating procedures, metadata development and management, standards for handling sensitive data, procedures for performing quality assurance and quality control, procedures for data backup and retention, data access restrictions, archival file formats, and provide for interoperability.

We recognize that the procedures we are likely to develop in close cooperation with the Marine Corps in the future may indicate a more efficient way of reporting the information identified in this section. We welcome recommendations to improve the reporting method, provided that any new method meets the requirements of the implementing regulations for section 7(a)(2) of the Act (50 CFR 402.14(i)(3)).

DISPOSITION OF DEAD OR INJURED DESERT TORTOISES

Within 3 days of locating any dead or injured desert tortoises, you must notify the Palm Springs Fish and Wildlife Office by telephone (760-322-2070), facsimile (760-322-4648), or electronic mail. The report must include the date, time, location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

We will advise you on the appropriate means of disposing of the carcass when you contact us. We may advise you to provide it to a laboratory for analysis. Until we provide information on the disposition of the carcass, you must handle it such that the biological material is preserved in the

best possible state for later analysis. If possible, the Marine Corps should keep the carcass on ice or refrigerated (not frozen) until we provide further direction.

The Marine Corps must take injured desert tortoises to a qualified veterinarian for treatment. If any injured desert tortoises survive, the Marine Corps must contact us regarding their final disposition.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend the Marine Corps work with the Service, Bureau of Land Management, and others to develop and help implement an integrated set of recovery actions for the Ord-Rodman ACEC and the contiguous Special Use Areas. In the project description for this biological opinion, the Marine Corps has committed to implement some actions that could form aspects of this strategy. Other actions to incorporate in such a strategy might include:
    a. use of vertical mulching or other techniques to reduce unauthorized use of routes that the Bureau of Land Management designates as closed through its route designation process within the Ord-Rodman ACEC;
    b. implementation of aspects of the Service's regional raven management program that are relevant to the Ord-Rodman ACEC;
    c. install desert tortoise exclusion fencing along each side of Highway 247 between the Mojave National Preserve's Barstow Office and the Lucerne Valley Cutoff Road and install culverts to maintain connectivity; and
    d. install desert tortoise exclusion fencing along south side of I-40 (north edge of Ord-Rodman ACEC) between the Marine Corps Logistics Base and Newberry Springs.

    Such a program would include collection of baseline data, effectiveness monitoring, and adaptive management to allow for long-term maintenance of implemented actions, implementation of management –related research, and incorporation of new recovery actions that are relevant to the Ord-Rodman ACEC. Development of this plan would require a collaborative effort with other partners and funding contributions to help provide for implementation.

2. We recommend that the Marine Corps coordinate closely with the Service to investigate specific research questions associated with head-starting. Through such coordination among the Marine Corps, the Service, and the several other head-starting facilities already in existence, we could determine whether the existing facilities are adequate to meet the recovery needs of the desert tortoise at this time.

3. We recommend that the Marine Corps work with the Service to more comprehensively address a broader array of Marine Corps actions and activities that may affect desert tortoises within MCAGCC. One potential method for accomplishing this would be to develop a programmatic biological opinion that covers all non-training related actions and activities within the MCAGCC installation.

We request notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

RE-INITIATION NOTICE

This concludes formal consultation on the Marine Corps' expansion of military training activities at the MCAGCC installation in San Bernardino County, California. Re-initiation of formal consultation is required where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

In instances where the amount or extent of incidental take is exceeded, the exemption provided under section 7(o)(2) may lapse and any further take may be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending re-initiation.

If you have any questions regarding this biological opinion, please contact Brian Croft of the Palm Springs Fish and Wildlife Office at 760-322-2070, extension 410.

Sincerely,

Digitally signed by GEORGE STEWART
Date: 2017.01.31 21:32:33 -08'00'

G. Mendel Stewart
Field Supervisor

Appendices
1 – Mojave population of the desert tortoise (*Gopherus agassizii*) 5-year review: summary and evaluation. Available on disk or hard copy by request or at https://ecos.fws.gov/docs/five_year_review/doc3572.pdf
2 - Graph that depicts trends in relative population density among permanent study plots in the western Mojave Desert and a map of the same area that depicts an analysis of the likelihood of finding a live desert tortoise (from Tracy et al. 2004)

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